ANIMALS OF THE WORLD

"MAMMALS OF AMERICA"
"MAMMALS OF OTHER LANDS"

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Animals of America

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PREFACE

IN preparing the text of "Mammals of America" two classes of readers have been kept constantly in mind — the inexperienced observer or layman who is yet fond of animals, and the trained naturalist or sportsman who wishes to supplement his field knowledge with exact book statement. The interest of both of these groups may be similarly keen, but their approach to the subject would necessarily be different.

Young people are naturally interested in all living things. From the house dog or cat to the zoological or circus animal, their attention is easily aroused and held. If in later years they do not keep their interest, it is because they have not been allowed to study the subject systematically, either in the classroom or at home. Natural History is, in fact, sadly neglected as a study, although one of the most fascinating of fields. Only the few become expert observers of animal life, while the many are content to learn the general aspects. For this reason, the ideal text-book should be so constructed that both groups of readers can turn to it with equal profit and pleasure. On the one hand should be set forth the picturesque and story-telling side of Nature — for that is the way she reveals herself to the casual passer-by — and, in addition, there should be system and accuracy of statement, in order to be of value to the advanced student.

This dual quality of popular and scientific treatment we have endeavored to obtain in "Mammals of America." We have presupposed no knowledge on the part of the reader; but at the same time have carried facts forward to a point of technical accuracy. In the introduction will be found the true starting point, in the question, What is a mammal? That defined, we next divide the mammals into orders, families, and species, and have, as it were, the framework of our structure. Turning now to the reading text we find the first order defined and followed by a diagram showing leading types of animals; and next come the animals under this order. The reader thus begins the book with a definite knowledge of the kinship of animals, which is essential to any study of types.

A word may be said as to why we begin with the Deer. The arrangement of the different orders and the sequence in which each animal is taken up, in most systematic works on mammals, follows the degrees of evolution. That is to say, the first mammals treated are the lowest in the evolutional scale and the work closes with the highest. If this conventional order of things were followed we should begin with the Marsupials and end with the Bats. But this arrangement has been set aside, in the present case, in order to secure an intensified interest on the part of the layman. By opening the volume with articles on the large, conspicuous ungulates it is hoped to secure a greater degree of interest on the reader's part from the very beginning.

The reading text itself is set in two styles of type. The smaller type at the top of each article is addressed to the more experienced observer who wishes to know exact facts. Here are given: (1) the animal's scientific name; (2) other names; (3) general description; (4) dental formula; (5) pelage; (6) measurements; (7) range; (8) food; (9) general remarks; and (10) related species. The larger type which follows gives a popular and story-telling description, of interest to every nature-lover, both young and old, and easily followed because of its avoidance of technical terms. But it is hoped that the interest there aroused will lead even the younger readers to turn back to the scientific statement. Interest in the subject is further sought by the inclusion of many pictures taken from living animals, and, so far as possible, in the open. In a few instances animals were caged, and in a few others, pictures were made from mounted specimens. But the large majority are from field subjects obtained at the cost of infinite time and patience, and occasionally at the personal risk of the photographer.

A work of this sort is dependent in large measure upon the published works of authorities which have preceded it. The recent observations of naturalists and sportsmen are of highest value only when checked up with earlier field work. We append a bibliography of the chief sources so used for " Mammals of America," as a partial acknowledgment of our indebtedness; and wish to mention particularly the works of Allen, Audubon, Bailey, Coues, Elliot, Grinnell, Hornaday, Ingersoll, Lydekker, Merriam, Miller, Pycraft, Roosevelt, Seton, and Stone, there listed. We wish also to thank Messrs. Charles Scribner's Sons for permission to use quotations from Theodore Roosevelt's articles appearing in their magazine; Dr. William T. Hornaday, Director of the New York Zoological Park, for permission to use material from his books, and for suggestions and courtesies; Messrs. George H. Doran & Co., for permission to use material by Daniel J. Singer; and various officials of the American Museum of Natural History, and the United States Biological Survey for their interest and active assistance. Thanks are likewise due to various outdoor magazines such as *Outing*, *Field and Stream*, *The National Sportsman*, and *Recreation*, for permission to quote from articles and use pictures found in their pages.

To the many photographers and field observers all over the land, whose patient and adventurous work speaks for itself in the following pages, we can express but imperfectly the debt of gratitude we feel. They have brought home to us the secrets of forest, field and water — showing us as no amount of printed words could do the reality of the outdoor world. Literally years of effort have gone into these pictures which speak to us from almost every page. Wherever possible we have credited the name of the photographer on each picture. Special photographs were obtained from the New York Zoological Park, by Mr E. R. Sanborn; the American Museum of Natural History, through Dr. G. Clyde Fisher; and the United States Biological Survey. A valuable series of pictures of moles, shrews, and rodents was obtained from the West Virginia University Experiment Station.

Following the text proper, the reader will find a brief but useful glossary of scientific or unusual words; a bibliography of sources already alluded to; and an index referring to the several hundred species by scientific name, common name, and other local names, so that even if only one name of an animal is known, it may be possible to turn at once to the page where it is described.

INTRODUCTION

WHAT is a mammal?

The beginner in any study has certain basic facts to acquire, and this is never more true than in an exactly related science such as natural history. It is absolutely necessary to begin here by mastering a few of the broad, underlying principles, in order to follow the subject diligently. These are not difficult to follow, if the reader takes them up one at a time in regular order; and the first question that would naturally arise in the present volume is, What is a mammal? To answer it, let us turn back for a moment to the beginning of animal life. All living animals fall under one of two heads, or kingdoms, as the naturalist calls them, the *Invertebrata* and the *Vertebrata*. The *Invertebrata* are the lowest forms of life, and are so called because of the fact that they lack a backbone, or spinal column. To this kingdom belong the hosts of creeping, crawling animals such as Worms, Insects, Molluscs, Sponges and Jellyfish.

The Vertebrate kingdom contains the higher types of life, beginning with such lowly forms as the Lancelets and Tunicates, and running upward in the scale to Man himself. The Vertebrates are characterized by the possession of a backbone, which is cartilaginous in the lower animal types, but formed of true bone in the higher. This kingdom may be divided into five divisions or classes, viz., the Fishes, the Amphibians, the Reptiles, the Birds, and the Mammals.

HOW MAMMALS DEVELOPED

Mammals are thought by competent authorities to have been developed from reptilian ancestors. They hold this belief because fossil reptiles of a highly specialized type have been found possessing mammal-like characters. The theory, in brief, is that from some very active, highly specialized reptile of this type, the first mammal was evolved at an early period. Mammals, however, are not an ancient class, when compared with other Vertebrates, for it is almost certain that the Mammals and the Birds are the latest arrivals of all.

Mammals differ from other Vertebrates mainly in the following characters: the possession of hair, mammary glands, a high blood temperature, a four-chambered heart, a diaphragm, a highly developed brain and nervous system, and also some very important characters in the skeleton. Probably the best-known character is the possession of hair to a greater or less degree, varying from coarse bristles to finest fur. This form of outer covering is opposed to that of other classes. For example, the Birds have feathers, the Reptiles scales, the Amphibians are generally naked, and the Fishes have scales.

A very important character of the Mammals, the one that gives the class its name, is the presence of mammæ, or breasts, on the female. These structures are necessary because Mammals bear their young alive and helpless, and they must be fed by the mother until strong enough to take care of themselves. In the other classes the young more often come from an egg, or, if born alive, are more or less able to shift for themselves.

The high blood temperature and the four-chambered heart are most valuable to the Mammals. Because of this fact alone they would be able to dominate the other classes. Long periods of sustained activity are possible only through a warm and consequently active blood stream. In all the other classes, except the Birds, the members have what is commonly called cold blood, or, to speak more exactly, a variable blood stream. This results in long dormant or sluggish periods. The warm-blooded Birds, on the other hand, lack the more highly developed heart of the Mammal. The diaphragm, a typically mammalian structure, is a thin muscular wall separating the cavity containing the lungs and heart from the other internal organs. This separation results in a better opportunity for the functioning of the various organs, and is a development upward. Finally, the brain of the Mammal is marvelously developed and is far in advance of that of members of other classes. The increase is in both quantity and quality, in volume proportionally to the weight of the animal, and in the development of the higher centers and convolutions.

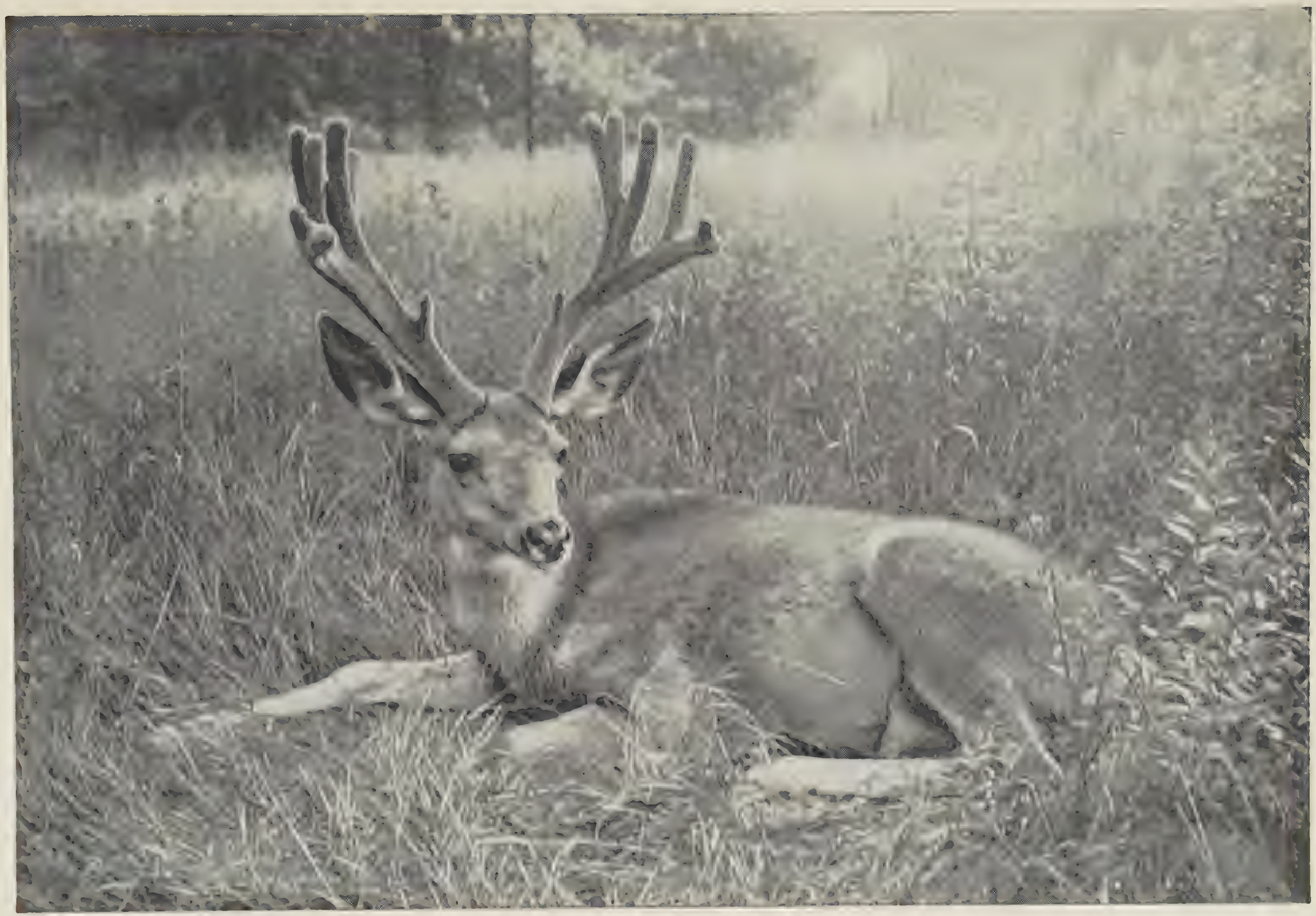
SUBDIVISIONS OF MAMMALS

Now with a better idea of what a Mammal, any Mammal, is, the next step is to see how its different members differ from one another. Students have divided the class *Mammalia* into two large divisions, based upon the degree of development; the least developed belong to the *Prototheria*, or ancient Mammals, while the more highly developed forms belong to the *Eutheria*, or modern Mammals. The *Prototheria* are represented today by only two types, the Duckbill Platypus, or *Ornithorhynchus*, and the Spiny Anteater, or *Echidna*, both very strange-appearing animals to be found only in Australia and neighboring islands. They lay eggs, but otherwise more closely resemble true Mammals than any other class, although they are connecting links with the lower animals. We are concerned only with the *Eutheria*, since all the North American Mammals belong to this subdivision.

Because of the wide diversity of types it was early found that, in order to make anything like a close study of Mammals, a careful classification must be arranged. This classification has been built up on names formed on Latin and Greek roots. The reason for this becomes evident when one learns the difficulty of trying to do anything with the so-called common names of Mammals. For example, the English-speaking settlers of North America brought over Old World names with which they were familiar, and applied them to New World Mammals with which they were not familiar. The result is that such animals as the American Elk and Buffalo have received these names from a fancied identity with Old World animals, while as a matter of fact these names are misleading and should apply only to the much different animals on the other side of the Atlantic. The common name of " Gopher " is variously used in different localities for Ground Squirrels, Chipmunks, and Pocket Gophers, and consequently means nothing in an exact treatise, whereas the scientific name of an animal means the same the world over. Thus the classification which at first appears to be cumbersome and unnecessary is seen to be absolutely essential to a clear understanding of the Mammals from widely separated localities.

HISTORY OF CLASSIFICATION

Attempts at classification were made in very early times. One of the earliest of these is contained in *Leviticus* XI, where Mammals are classified into those that divide the hoof and chew the cud, and the Camel, the Cony and the Hare are enumerated among others. The early Assyrians (about 668 B. C.) made an evident attempt to classify into divisions like our modern families and genera, for they put the Dog, Lion, and Wolf into one category and the Ox, Sheep and Goat into another. The history of classification begins with Aristotle (B. C. 384–322) who was a good observer and compiler, but who has commonly been credited with ideas more advanced than were actually the case. He uses the words genus and species. Following Aristotle comes a long lapse of time wherein nothing of great importance was added to the classification of animal life. Gesner (1551–1558) and Wotton (1552) are the landmarks for the 16th century. Ray (1693) began with the method of the Greeks, but left a method that marks most decided advances. His tables of classification chose characters of more fundamental value, and he discarded the habitat or home of the animal as a means of classification. Earlier writers made up groups into Terrestrial, Aquatic, and Amphibious, regardless of the true relationships of the animals. For example, the Seal and the Frog are both



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MULE DEER

This attractive picture is the more interesting because it shows the Deer's antlers in the velvet, or immature stage

Amphibious, but are far apart in true relationships. In addition Ray designated many terms that are in use today such as *Carnivora*, *Ungulata* and *Insectivora*.

The real foundation of modern scientific classification is found in Linnæus (1707–1778). His *Systema Naturæ* passed through twelve editions; beginning in 1735 as a mere brochure of twelve pages, by the time the twelfth edition was published, in 1766, he had so added to it that it was a work of 2400 pages. The *Systema Naturæ* is an orderly treatment in a systematic manner of the entire animal kingdom as then known. The analysis is philosophical, the diagnoses clear and workable, and the details quite generally correct. The modern designation of an animal by two names (the lion = *Felis leo*) goes back to Linnæus. He coined the word "mammal" and made the possession of mammae a character of the entire class. This brought together in a single class for the first time the terrestrial hairy quadrupeds and the whales. Man was placed among the *Primates*, where he belongs. After Linnæus, Erxleben (1777), Buffon, and Daubenton (1753–1767), Geoffroy St. Hilaire and G. Cuvier (1795), Cuvier (1796–1836), De Blainville (1816, 1834), Darwin and Huxley, Owen (1868), Gill (1870), Cope (1891, 1898) and Weber (1904) are the most important workers among a number of earnest students of animal life. The later steps are mainly the result of a better knowledge of anatomy, an increased amount of material for study, and the refinement of scientific methods in general.

ORDERS AND OTHER GROUPS

The scientific classification of today is based upon a progression of subdivisions beginning with the class and ending with the species and sub-species. The class is subdivided into sub-classes, the members of each sub-class having some group of important fundamental characters in common. The next subdivision in rank is the order, which is itself a very large group, then next in importance follows the sub-order, beneath that the family and sub-family, the genus and sub-genus and finally the species and sub-species. The following diagram illustrates this arrangement better than a written description.

CLASS — MAMMALIA = MAMMALS

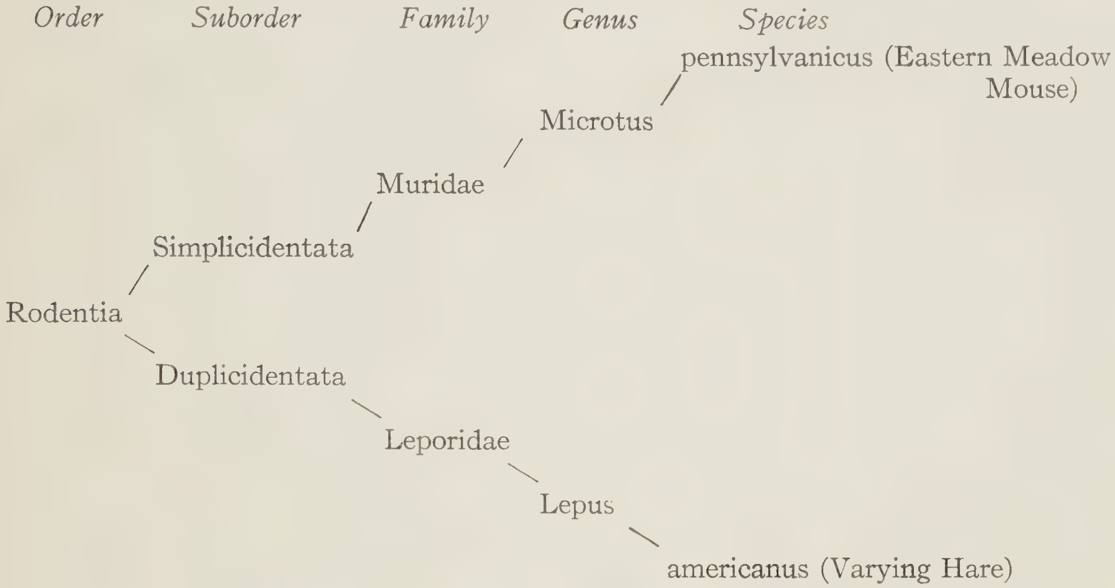
Sub-class – Eutheria = Modern Mammals

    Order — Marsupialia = Marsupials, or Pouched Mammals.
    Order — Edentata = Sloths, Armadillos, etc.
    Order — Ungulata = Hoofed Mammals.
    Order — Sirenia = Manatees, Dugongs.
    Order — Cetacea = Whales, Porpoises, Dolphins.
    Order — Rodentia = Rodents.
    Order — Carnivora = Flesh-eating Mammals.
    Order — Insectivora = Insect-eating Mammals.
    Order — Chiroptera = Bats.
    Order — Primates = Lemurs, Monkeys, Apes, Man.

The above carries the classification through all the mammalian orders of the world. Each order in turn is subdivided in much the same manner as the following diagram:

Order — Rodentia.
  Sub-order — Simplicidentata = Rats, Squirrels, etc.
    Family — Muridae = Rats and Mice.
      Sub-family — Microtinae = Meadow Mice, Voles.
        Genus — Microtus = Common Meadow Mice.
          Species — pennsylvanicus = Eastern Meadow Mouse.

This diagram shows how the subdivision passes from the larger to the smaller group until finally a group is reached that contains only a single, particular kind of Mammal, and this group we call a species. Of course it is obvious that each of the larger groups may have more than one of the lower groups. Every Mammal has a similar place in the scheme, but always its relationships to any other Mammal are shown by the fact that the two will be included in some common group, if the groups are followed back far enough.



Thus we see that the Eastern Meadow Mouse and the Varying Hare can claim no closer relationship than that expressed by inclusion in the same order, a rather distant relationship. The higher the rank of the first including subdivision, the more remote the immediate relationship of any two Mammals. In common practice the sub-groups, like the subfamily, sub-genus, and sub-species are often omitted, although with the knowledge that these groups exist, the full divisions themselves expressing all the ordinary needs of relationship.

SCIENTIFIC NAMES

For convenience sake and to show the authority for a name, it is customary to place after a scientific name the name of the man who first described the animal. Thus, the scientific name for the Eastern Meadow Mouse is written *Microtus pennsylvanicus* (Ord). This means that Ord first gave a name to the animal we know as the Eastern Meadow Mouse; while the parenthesis about his name indicates that the name has been somewhat changed by some later authority from its original form. Ord called the animal *Mus pennsylvanica* not knowing that the name *Mus* was first used for a different animal, an Old World rat, and consequently could not be used for the American animal too without creating confusion; therefore, a later worker straightened out the confusion and put parentheses about Ord's name to indicate the change. No parentheses means that nothing has been changed, and that the name stands as its author first wrote it.

EVOLUTION A CONSTANT FACTOR

The real necessity of a classification arises from the plastic nature of animal organisms. If the Mammal were not the plaything of its environment, we should not have a multitude of different mammals, and consequently we should not be at a loss to find names and relations for the thousands of varied forms about us. Evolution is a constant factor in the animal world. No matter how biologists may differ about the modes of evolution, nowadays none of them will refuse to admit that changes have taken place in the different animal structures. Evolution may be either progressive or retrogressive, resulting in specialization or degeneration.

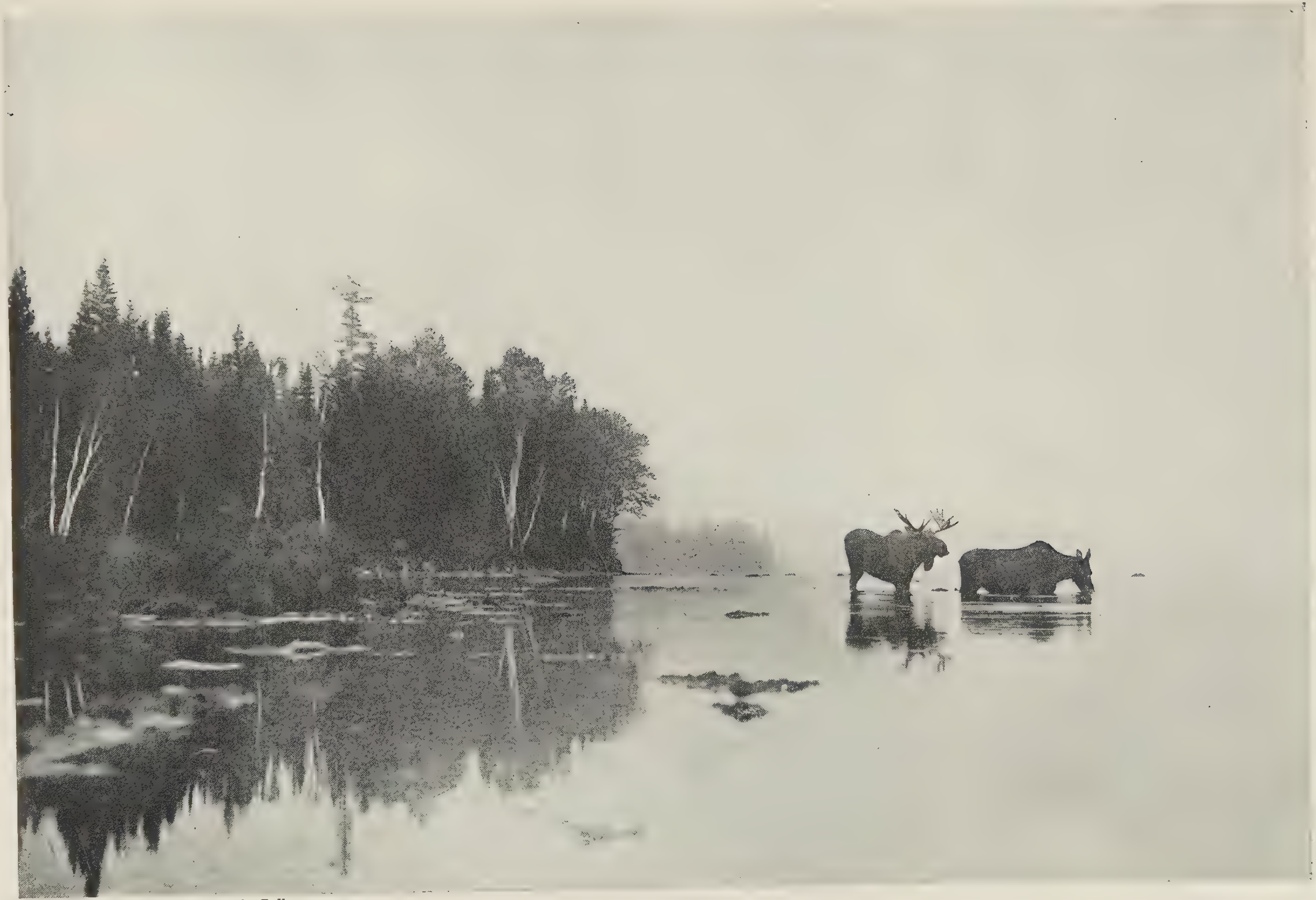
Evolution is expressed in a multitude of ways. The hair, the structure that on the Rabbit is so soft and flexible, through specialization becomes the quill of the Porcupine, a complex structure very little like the hair from which it has been evolved. This is called specialization through change in form. The difference in the character of teeth, such as the flat grinding tooth of a cow and the sharp shearing tooth of a cat, is a specialization of this sort. Another type of specialization results in the loss of parts. This is illustrated by the evolution of the Horse from a little five-toed animal of an older geological epoch into a one-toed animal of today. Specialization that results in the increase or addition of parts is seen among the bats, where many complex structures on the nose and in the ear occur. Minor changes in Mammals are to be seen on every hand. Such changes are those in the colors of the pelage to suit the environment, the increase or decrease in size of a species to suit the food supply, and the growth of special areas of hair, like the tufts on the ears of the Lynx.

Just exactly how all these changes are brought about is a fruitful source of argument among students of biology, but two main factors are currently recognized, namely, heredity and the effect of environment. Heredity might be construed as the result of an earlier environment which then would make environment the main factor. Certainly a close connection can almost always be established between an animal's structure and its environment. As a result of the competition among animals, bringing into operation the principle of "survival of the fittest," the Mammals have spread out into every conceivable environment, every possible economic niche opened up to them by nature. We find Mammals of different orders occupying the same niche; but generally when a Mammal has thoroughly mastered its environment, its advantages are such that an intruder cannot meet it in active competition and survive the encounter. "Adaptive radiation " is the name given to this spreading out of a certain type of Mammal life. Rodents, for example, have become specialized to the point that we find them living successfully as typical terrestrial animals (the Chipmunk), as semi-subterranean (the Ground Squirrel), as wholly subterranean (the Pocket Gopher), as aquatic (the Beaver), as arboreal (the Gray Squirrel), and finally as semi-aerial (the Flying Squirrel). In this same order, the method of locomotion has passed from the typical running on all fours to swimming, to crawling in restricted burrows, to leaping kangaroo fashion with the hind legs alone, and to gliding like an aeroplane

The distribution of Mammals has become very general because of this adaptability to environment. Mammals becoming accustomed to cold climates have extended their ranges until some species are found under the Arctic Circle and on the highest mountain peaks where intense cold reigns. On the other hand, desert Mammals have pressed into the heart of the most arid, hopeless wastes of sand. Food seems to be the only requirement necessary, lack of water and cover seeming to have little effect. As a rule, the largest and best-developed fauna, however, is to be found where conditions are most suitable.

REQUIREMENTS FOR STUDY

The requirements for the study of Mammals are primarily few, and most of us already possess them. The average child has a keen interest in the life about him and ordinarily in the process of growing up acquires considerable knowledge of the commoner animals of his vicinity. Given the interest, a sharp eye and an acute ear are material aids of first importance. Observations often need to be interpreted, the interpretation not infrequently calling for the skill and experience of the zoologist. Many things to be noted, however,



Photograph by Mrs. Howard A. Colby

AN AFTERNOON SIP

Bull and Cow Moose, at Longley Lake, Maine, on the last day of September. Differences in build of these two animals are well shown are so self-evident that every one sees the meaning, and thus upon observation depends the extent of the individual's study. Observation, reading, and scientific method are the student's trinity. Some Mammals lend themselves readily to observation, as, for example, the Squirrels and Hares; while others require more skill in pursuit, but yet may be watched if moderate pains be taken, the Pocket Gophers and Woodchucks coming into this category. Still others, although not particularly rare, are difficult to observe, and experienced students live a lifetime without adding much first-hand knowledge to their store; such common Mammals as Bats and Moles having little-known life histories to this day. Lastly, the method gained by the study of a systematic account of Mammals, or any other class of animal life, will never be regretted in any pursuit, or at any time, for, cloaked in an entertaining garb, the basic principles that underlie all sciences have been introduced to the student, and as a consequence he should be the gainer in accuracy of observation, interpretation, and well-rounded knowledge.

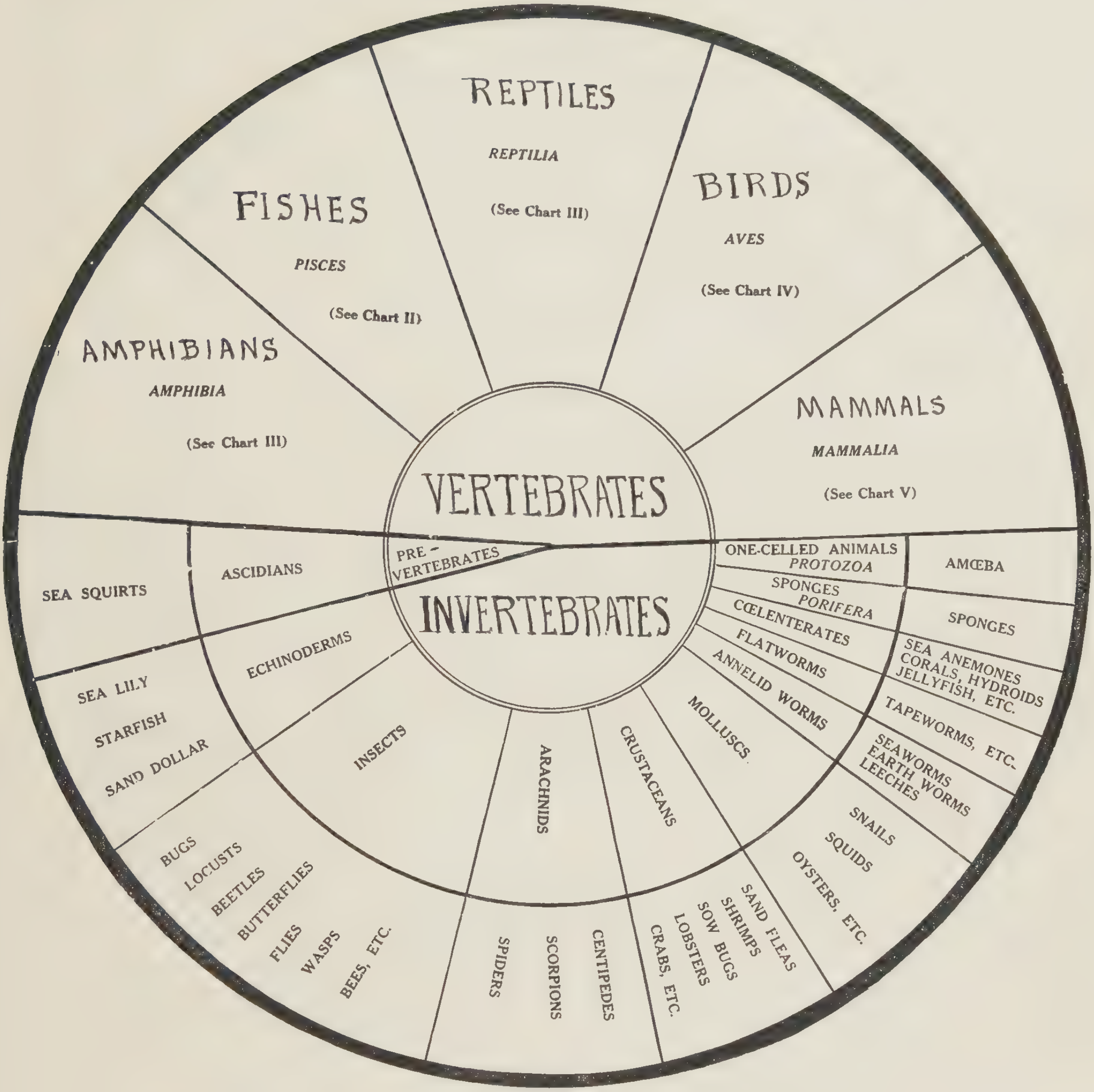
H. E. Anthony

Photograph by H. A. Colby

SURPRISED

An actual photograph of a flashlight exposure, showing how night pictures of Deer and other animals are obtained

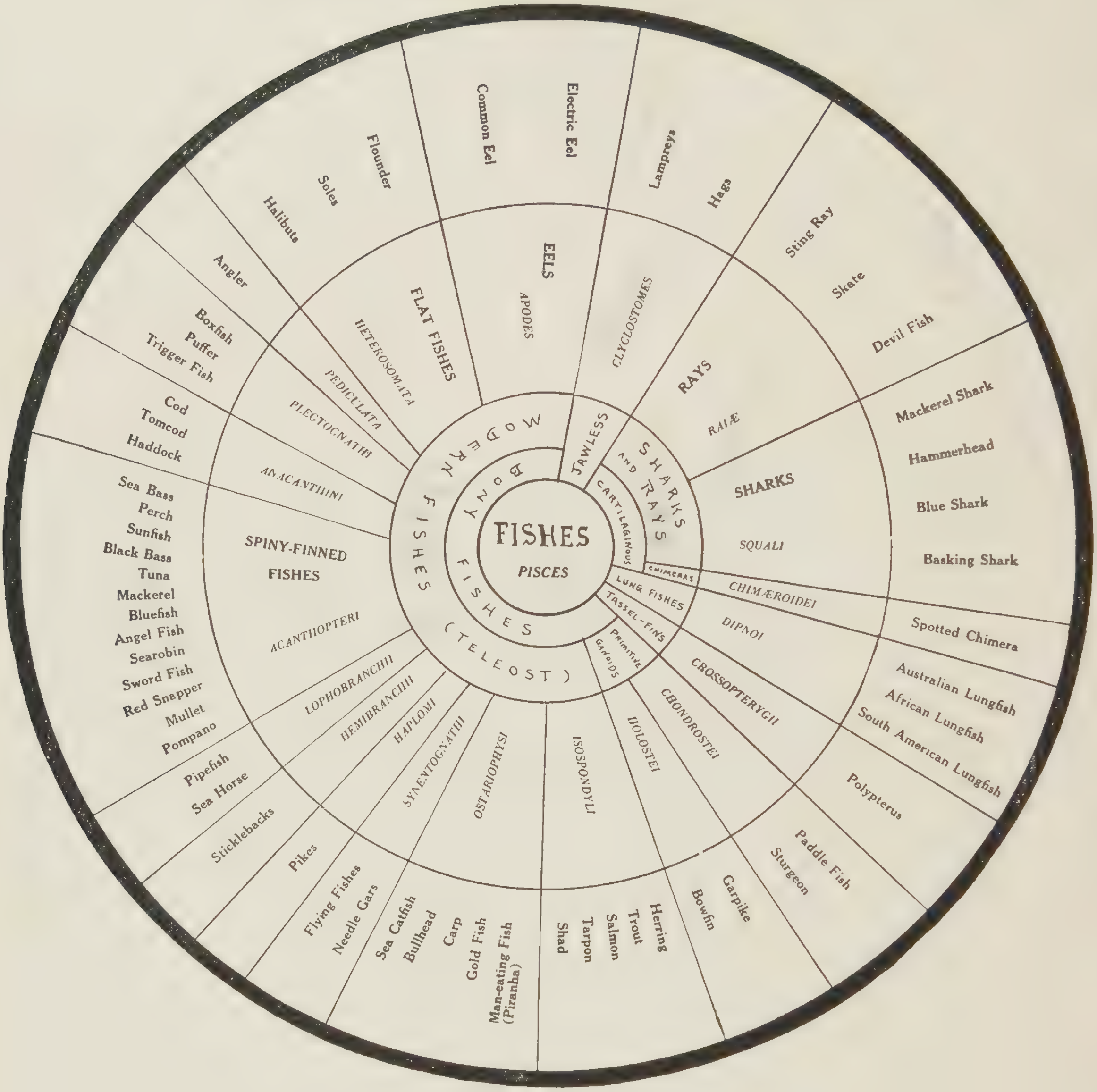
CHART I



VERTEBRATES AND INVERTEBRATES

The above may be regarded as a Key Chart to those which follow; but it is graphic and not evolutionary. While the entire Animal World is divided into two Kingdoms — the Invertebrates, or Spineless Animals, and the Vertebrates, or those having a spinal column,— the latter in the scheme of evolution are derived from or through the former. Also, for the sake of ease of reference, the main divisions of the Invertebrates are indicated above; while the Vertebrates are referred to other charts. The Pre-Vertebrates, as shown above, are an intermediate form between the two Kingdoms.

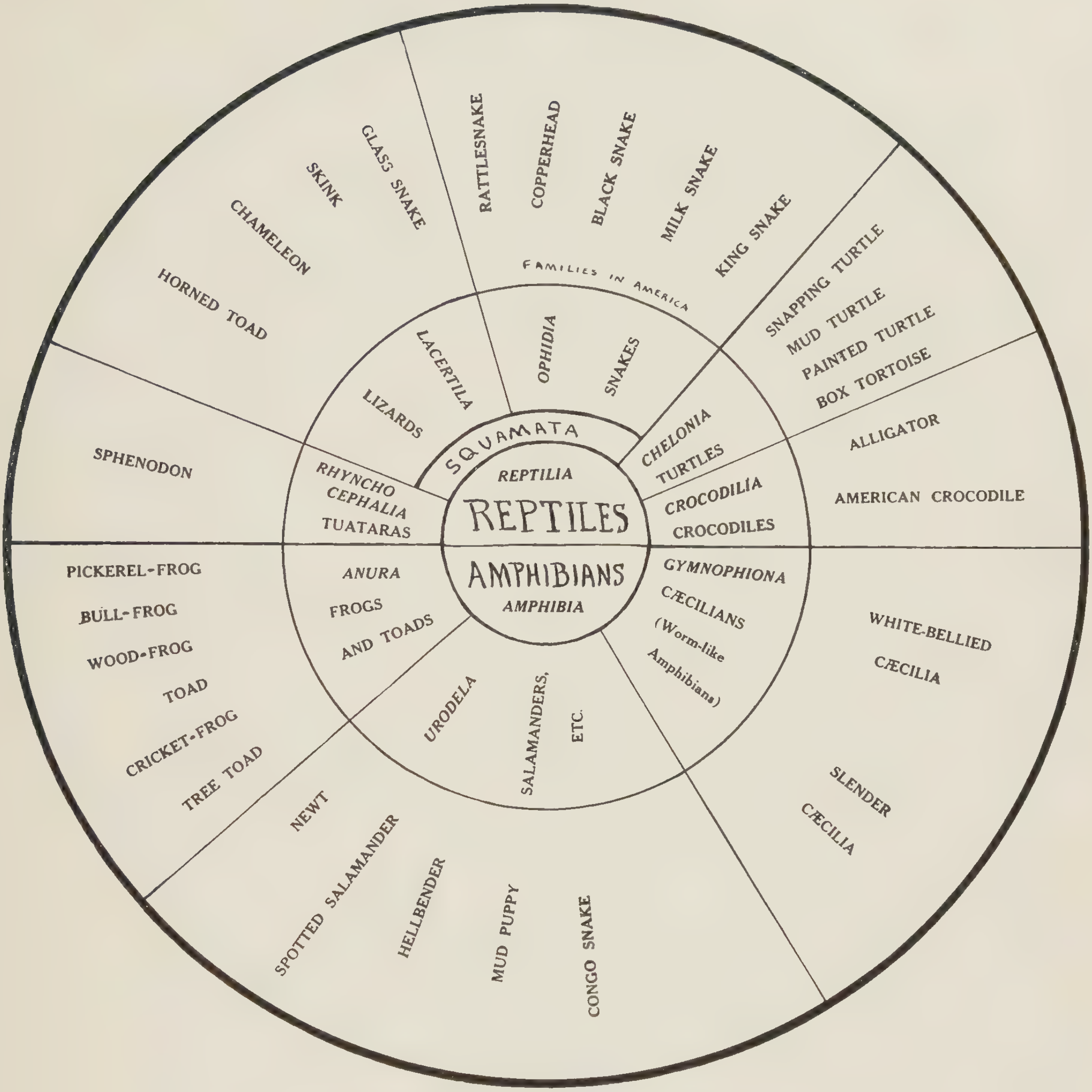
CHART II



FISHES

Fishes are among the oldest forms of Vertebrate life. Their fossil remains have been found in strata belonging to the upper part of the Silurian division of the Palæozoic epoch. They may be broadly described as cold-blooded Vertebrates, adapted to a strictly aquatic life, breathing by means of gills, and with external limbs modified into fins. In the above chart, emphasis in some orders has been placed upon forms familiar to American waters.

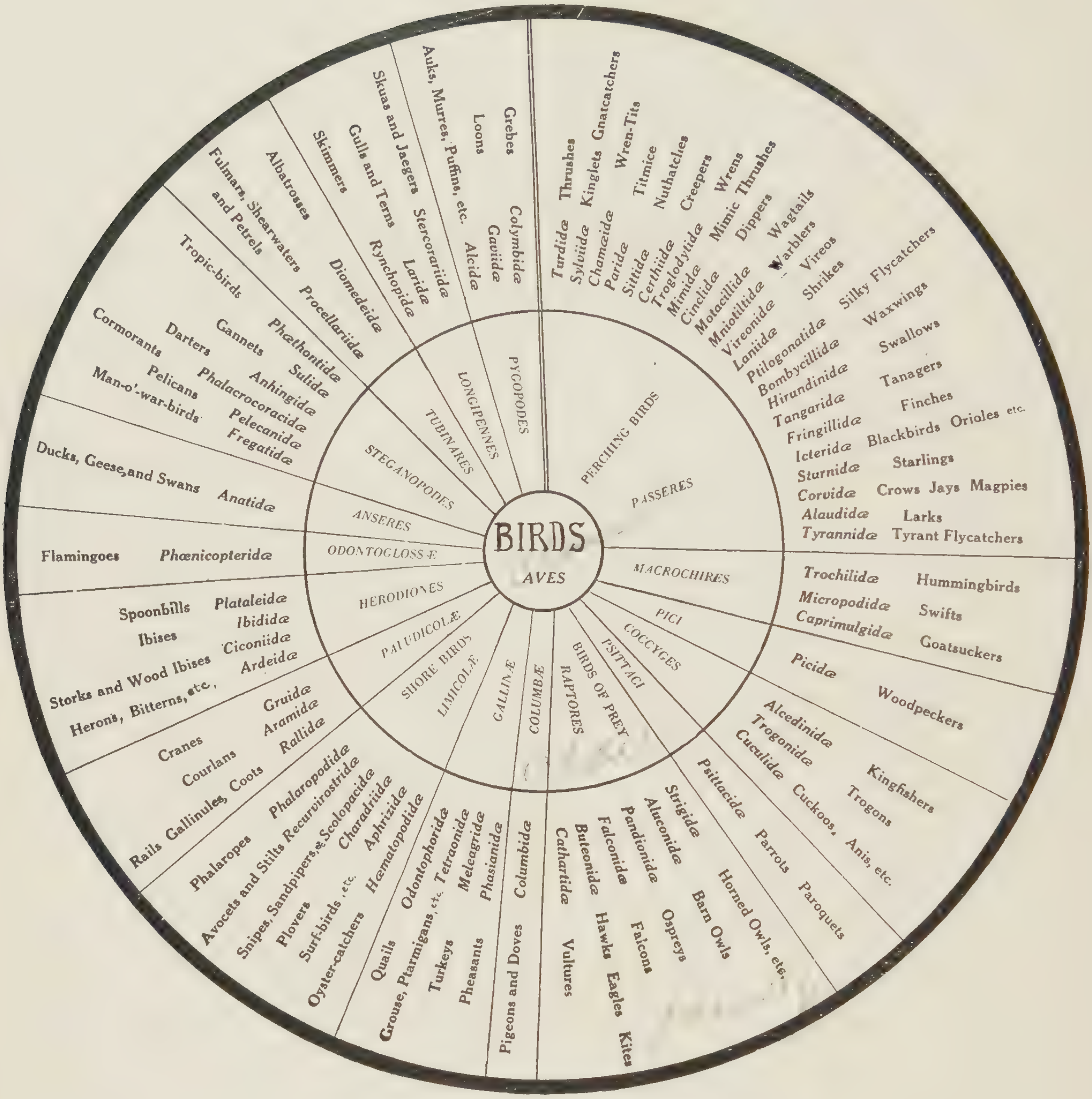
CHART III



REPTILES AND AMPHIBIANS

These two classes are often confused in the popular mind. The term, Reptile, has been applied indiscriminately to Crocodiles, Turtles, Snakes, Lizards, Tuataras, Frogs, Toads, Salamanders, and Cæcilians; whereas it belongs correctly to only the first five groups, the others being classified as Amphibians. There are important structural differences. The Reptiles on their higher level are the ancestors of the Birds. Their lower forms are closely related to the Amphibians, which, in turn, are intimately connected with the Fishes. There are intermediate forms, also, which make it difficult to distinguish boundaries sharply. A majority of the Amphibians undergo metamorphoses, or changes, before reaching their final form.

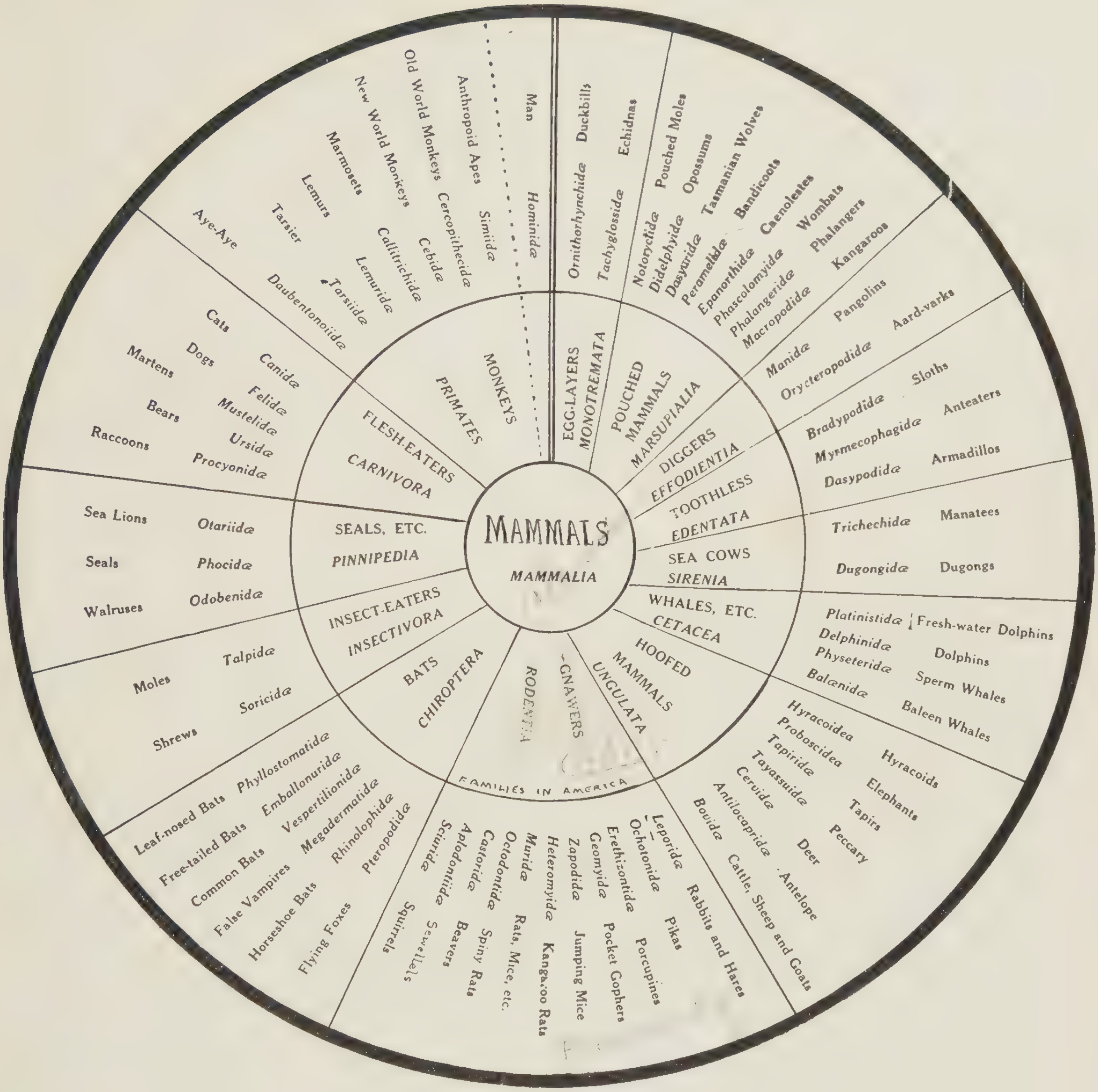
CHART IV



BIRDS OF AMERICA

The above chart is limited to a consideration of the Birds of America, only; the reason for this being twofold. The world at large contains hundreds of bird families, which could not be included in a chart of this size, with ease or profit to the student. Secondly, the above classification follows that officially adopted by the American Ornithologists' Union, showing seventeen orders, beginning with the lowest forms, the Diving Birds, and ending with the highest, the Perching Birds. The classification by certain foreign authorities shows a larger number of orders (usually 21) some of which overlap the American classification through sub-orders. The terminology, also, is different. It was thought best, therefore, to limit this chart to American orders and families, and to use only the names by which they are recognized in this country.

CHART V



MAMMALS

In the Mammals we reach the highest forms of animal life, the final order including Man himself. The lowest forms include the Monotremes, or Egg-Laying Mammals, and the Marsupials, or Pouched Mammals. The gradual ascent upward is shown on the above chart, reading from right to left. Mammals differ from other animals in the following characters: the possession of hair, mammary glands or breasts, a high blood temperature, a four-chambered heart, a diaphragm, and a highly developed nervous system. In the above chart a general world survey is made, except that, under Rodents, only the American families could be included, because of the very large number of these little Gnawers all over the world.

ORDER OF HOOFED ANIMALS

(*Ungulata*)

THIS order is one of the most important among animals. It includes some of the largest mammals both in this country and abroad. The order is called "Ungulata" from a Latin word meaning "hoofed." In this order are to be found the deer, pigs, sheep, oxen, horses, elephants, etc. The Ungulates are nearly all animals of good size and some of them are the largest of living land mammals. They are thus characterized: the toes or digits end in hoofs, and the animal walks upon the toes or is digitigrade; they lack the clavicle or so called "collar bone"; a full set of milk teeth always precedes the permanent teeth; the molar teeth have ridged or tuberculated grinding surfaces.

This order is commonly split up into two sub-orders as follows; the odd-toed Ungulates or *Perissodactyla*, such as the Horse and the Tapir, and the even-toed Ungulates or *Artiodactyla*, to which all the North American mammals of recent times belong.

The *Artiodactyla* is a very large group, and besides containing all the North American Ungulates, claims as well nearly all those of the Old World, and the host of African Antelopes.

VIRGINIA DEER AND FAWN

These beautiful animals are easily domesticated, and their breeding might become a profitable industry

Animals of this sub-order have the first toe wanting, the second and fifth toes small, rudimentary or absent, and carry the weight upon the third and fourth toes. Animals of this type generally have extremely long feet and legs, and for this reason are fleet and graceful runners.

The hoofed animals are herbivorous — that is they eat herbs and vegetation. In the Deer, Oxen and Sheep families they are also ruminants, or cud-chewing. The ruminants have a four-compartment stomach, regurgitate or bring up their food, and chew the cud. As a rule they lack the upper canine teeth. All of the North American Artiodactyls have frontal appendages in the shape of horns or antlers, if not found in both sexes, at least to be found on the male. The order is well represented on all the continents of the globe, with the exception of Australia, but at the present day it has a far larger number of species in the Old World than in the New; many of these from the former area belonging to groups quite unknown in the latter. Although represented in the Arctic regions only by the Reindeer and the Musk-ox, Ungulates are found alike in the coldest and the hottest regions of the globe. The maximum number of peculiar forms, as well as those of greatest size are, however, inhabitants of the tropical and subtropical regions; and it is also in the warmer regions that the greatest number of species occur. As regards the number of individuals of peculiar species, many Ungulates far exceed any other of the larger mammals; this being the case with the Bison, which but a few years ago roamed in countless thousands over the prairies of North America, and with the myriad hosts of Springboks in the South African veldt. Not only are the Ungulates widely distributed in longitude and latitude, but they are also found at all elevations suitable for the existence of animal life; some of the wild Sheep of the Himalaya ranging to elevations of fully twenty thousand feet above the level of the sea. In time the order is an ancient one, being represented in the earliest stages of the Eocene division of the Tertiary period, although the species were mostly small, and in all cases widely different from any now living.

The following diagram shows the division into families and species, in this country:

ORDER OF HOOFED ANIMALS (UNGULATA)

FAMILIES

(In North America)

Peccaries
(*Tayassuidæ*)
(Only species)
Collared Peccary

Deer
(*Cervidæ*)
(Typical species)
Wapiti, or Elk
White-tailed Deer
Black-tailed Deer
Mule Deer
Moose
Woodland Caribou
Barren-ground Caribou
Reindeer

Antelope
(*Antilocapridæ*)
(Only species)
Pronghorn Antelope

Oxen and Sheep
(*Bovidæ*)
(Typical species)
Bison, or Buffalo
Musk-Ox
Rocky Mountain Sheep
Rocky Mountain Goat

THE DEER FAMILY

(*Cervidæ*)

THE Deer family stands next to the Cattle and Sheep family (*Bovidæ*) in general utility. The flesh is a valuable food, while the antlers or horns, as well as the skins, are important articles of commerce. Venison was more common than beef on the tables of medieval Europe, and was the flesh most commonly eaten by early settlers and frontiersmen in North America. Its dietetic value is enhanced by the fact that it is especially adapted to invalids who require a nourishing yet easily digested food.

Except in a few species like the Caribou, adult male Deer have antlers. Although these horns are deciduous, they are solid processes produced from the frontal bone, and have the physical as well as the chemical properties of true bone. They are of two general types — those more or less broad and flat, and those rounded in shape. Those of the flattened type are usually the more massive, but the rounded antlers of the Wapiti are exceptionally heavy.

Deerhorn has several uses. It produces much gelatin by decoction, the product being like that from most animal substances. The raspings and waste pieces of the horns used in manufacturing knife handles are either made into gelatin or boiled down into size used in cloth manufacture. At one time deerhorn was a prominent source of ammonia.

The principal use of deerhorn is in the manufacturing of handles for knives, forks, and other instruments. In Sheffield, England, some thirty years ago, about 500 tons of deerhorn were used annually in manufacture. India and Ceylon furnished about four-fifths of this material, while about 100 tons came from European and English deer forests. The 500 tons represented the antlers of fully 350,000 Deer of various species. In Europe buckhorn is worked up into many useful articles, as umbrella stands, chandeliers, and ornaments for personal wear.

The use of deerskins is well known. As tanned and dressed by the American Indians they are manufactured into a variety of useful and ornamental articles. The inhabitants of some of the Indian villages of the North derive a good income from their manufactures of deerskins into moccasins, rackets, toboggans, and other things for sale. Deer hide makes an excellent leather, its value depending upon the size as well as upon the species from which it comes. The skins of Wapiti, for instance, are porous, and the leather does not wear well, while those of the Moose and European Elk are so thick and hard that the leather is said to have resisted musket balls. In Sweden in former times a pair of elk-hide breeches went as a legacy through several generations of peasants. Formerly about 200,000 deerskins from North America were sold annually in the London market. Half of these were skins of the Wapiti. Many were bought for Germany and there manufactured into leggings, but the heavier skins were tanned and manufactured in England. In recent years the export of deerskins from America has fallen off greatly.

Deer hair has a peculiar cellular structure, and is used in some parts of the world for stuffing saddles, for which purpose it is especially suited.

North America is comparatively rich in species of Deer. All of them are valuable food animals, and nearly all have been of great commercial and economic value during the development of the country. While their commercial importance has been greatly lessened as their numbers diminished, they still play an important part in furnishing food in newly settled parts of the United States and Canada, as well as in feeding the native tribes in the far North. Except in States that have extensive forested areas and have protected deer for a series of years, they are rapidly disappearing before the encroachments of agriculture. The remnant are valuable chiefly because they are a natural resource which may be indefinitely developed if carefully husbanded. David E. Lantz, U. S. Biological Survey.

WAPITI, OR AMERICAN ELK

Cervus canadensis (*Erxleben*)

General Description.— A large member of the deer family, the male with massive antlers shed annually, the female hornless and smaller. Weight of adult bull, 600 pounds or more. Color, yellowish-gray to tawny-brown. Tail short. A fine, well-proportioned animal standing about five feet at the shoulders. Gregarious in habit.

Dental Formula.— Incisors, $\frac{0-0}{4-4}$; Canines, $\frac{1-1}{0-0}$; Premolars, $\frac{3-3}{3-3}$; Molars, $\frac{3-3}{3-3} = 34$.

Pelage.— ADULTS. Sexes essentially similar in coloration, but female generally with the dark colored parts paler than in the male. General body color tawny-brown varying with the individual. Head, neck, chest and under parts darker brown to nearly black; legs clove-brown. A large conspicuous straw-colored patch on rump, surrounding tail. Hairs on neck long and forming a shaggy mane. Hairs everywhere rather long and coarse. YOUNG. Tawny spotted with white until the first fall, when pelage resembling that of the adults is assumed.

Measurements.— Total length 8 feet for male, 7 feet for female. Tail 8 inches. Height at shoulder 5 feet. Weight, male, 600 to 700 pounds. Horns of a record bull 64 and 66 inches along the beam.

Range.— Formerly from the Atlantic Ocean to the Rocky Mountains. Now limited generally to western Canada, Montana, Wyoming, Colorado, and the Pacific Coast.

Food.— A variety of grasses, leaves and buds.

Remarks.— The American Elk is not to be confused with the Elk of the Old World, an animal more nearly related to the North American Moose. With the exception of the Moose, the Wapiti is the largest of the American deer family. All of the different varieties of Wapiti are variations of the same general color pattern and contour.

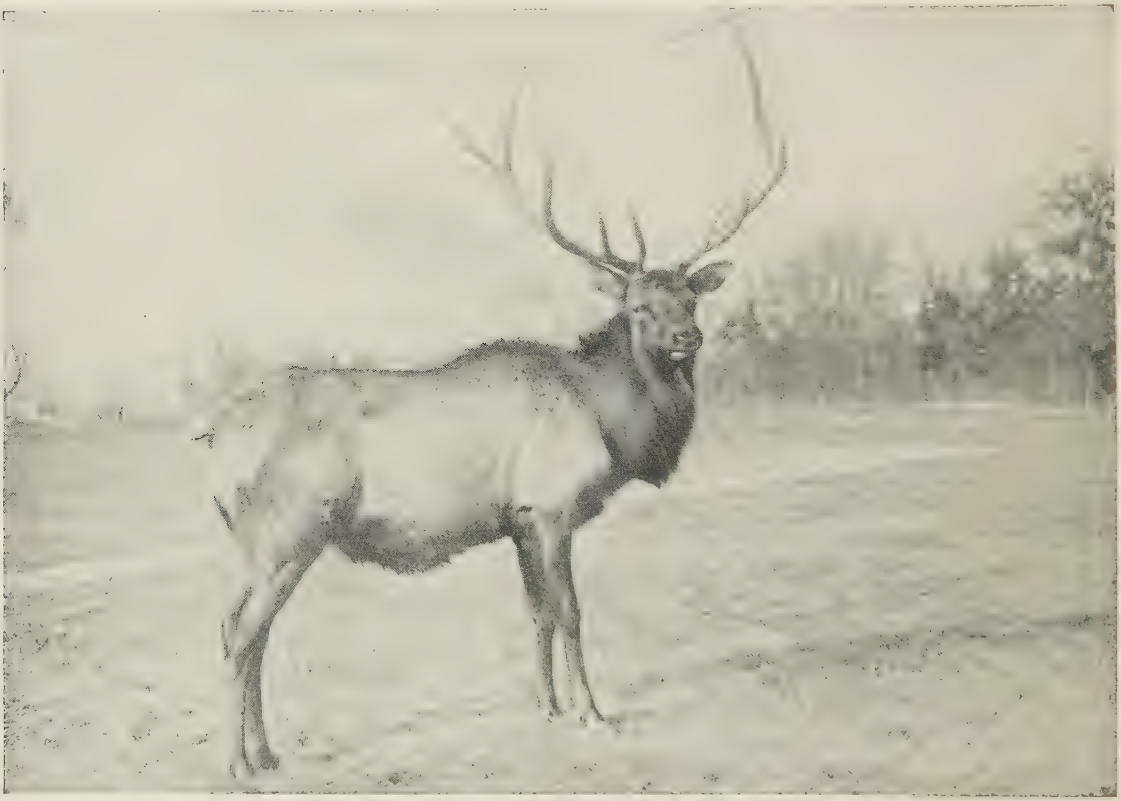
RELATED SPECIES

American Elk, or Wapiti.— *Cervus canadensis canadensis* (Erxleben). The typical form just described. Eastern North America to the Rockies, but today extinct over eastern portion of this range.

Western Wapiti.— *Cervus canadensis occidentalis* (Ham. Smith). Darker in coloration. Extreme western North America.

Merriam Elk.— *Cervus merriami* Nelson. Nose darker, head and legs redder than *canadensis*. Mountains of western New Mexico and eastern Arizona. Probably extinct.

California Wapiti.— *Cervus nannodes* (Merriam). Smallest of the Elk; pale. Known only in California, and nearing extinction.



By permission of the New York Zoological Society

WAPITI, OR ELK

The American "Elk" is, next to the Moose, the largest of the Deer family, and is easily the handsomest. It has superb widely branching antlers

"Monarch of the glen, lord of the wilderness, king of the red deer tribe is the Wapiti," says Singer. "The antlers are the most magnificent trophies yielded by any of our American game animals, save the single possible exception of the giant Alaskan moose. Even so, the length of horn of the Wapiti with its wide, graceful sweep, long tines, massiveness, and symmetry is more admired and desired by many than the huge, heavy, grotesque antlers of the moose."

Naturalists and sportsmen agree in designating the Wapiti or "Elk" as the handsomest of the deer kind. "A creature of regal presence," "the lordliest animal on earth," are among the descriptions of it one finds in the diaries of hunters and in works on natural history; Colonel Theodore Roosevelt considers it to be "the grandest of the deer kind throughout the world" and its antlers as "marvels of symmetrical grandeur."

"A full-grown Wapiti is normally of twelve tines," says Singer. "The cows grow no antlers, differing in this respect from the caribou cows which grow small pointed antlers. It would not be amiss at this point to call attention to the difference between horns and antlers. A horn is a hollow sheath growing over a bony substance, and except in the case of the antelope, it is never shed. Horns are worn by both sexes of all bison, buffaloes, antelopes, sheep, goats and cattle. An antler is a solid bone throughout, growing from the skull, and is shed every year close to the skull, and quickly regrown. They are worn by nearly all male members of the deer family — moose, wapiti, caribou, deer, etc."

The Wapiti is one of the round-horned deer. For an animal of its size and weight, its legs are comparatively slender. It carries its head high, and has a luxuriant mane. The general body color is a pale tawny brown; the head, neck, and chest are dark brown; and there is a large yellowish white patch on the rump. The coat is shed between May and the middle of September.

A native of North America, the history of the Wapiti is a repetition of that of the Bison — persistent and ruthless slaughter by man. In former times it was found over most of the North American continent, from Mexico to Vancouver, and from New Jersey across the Alleghenies to the Pacific coast. It lived, like the Buffalo, on the open plains. In 1849 in the great valley of San Joaquin, in California, bands of Wapiti numbering many thousands roamed like cattle. Today it is confined chiefly to the northern region of the Rocky Mountains, but nowhere can it be said to be abundant except in the Yellowstone National Park, where perhaps there are some 30,000. Small herds and scattered individuals are occasionally met with in various States, and Wapiti from private parks and preserves have from time to time been liberated in various forests, as by Mr W. C. Whitney in the Adirondacks, in the Saranac Lake region, and elsewhere. It is gratifying to note that the number of States in which this lordly animal receives protection is increasing.

The King of the Cervidæ, for as such is the Wapiti looked upon, differs from his lesser kin, the Mule Deer, in that he is more gregarious and highly polygamous. Another point of difference is that he is not given to feeding at night, but at the first indication of day and in the late afternoon. During the day they lie down usually on an open, sunny hillslope facing the south, or in the timber if much hunted. In winter when the snow is deep they are naturally more inclined to browsing, even standing on their hind legs to enable them to reach higher up in the trees. They are especially fond of aspen, birch and the tops of the willows. In winter they gather in large bands and keep the snow well trodden down in the locality which they have selected.

The shedding of the antlers of the full grown stag usually takes place late in December or during the month of January. The spike-horn bulls do not shed until much later, often as late as May or June. They are proud of their little sharp antlers, and do not hesitate to remind with a prod the old bulls who have shed, that they are still well armed. The new antlers begin to sprout in March or April, and during the summer while growing they are covered with hair, and are soft and full of blood, with club-like knobs. In this condition they are spoken of as being "in the velvet." It is a great drain on their system while this remarkable growth is going on. The stags grow thin and the fear of hurting their young antlers, which are very tender, makes them quite timid and inoffensive. By the middle of August the antlers are completely grown and the covering or velvet is then rubbed off against trees and bushes, and the ends of the tines polished. For many are the battles to be fought before gaining full possession of a harem.

The mating season varies in different localities, but usually begins in September. At this time the bulls become very pugnacious; their necks swell; and they challenge continually. The call, or "bugle," of the male Wapiti is described by

Dr. Hornaday as " a shrill shriek, like an English locomotive whistle, sliding down the scale into a terrific bawl "; but Colonel Roosevelt considers that, " heard at a little distance, and in its proper place, it is one of the grandest and most beautiful sounds in nature." The fawns, usually one or two, but occasionally three, are born in May or June and sometimes as late as August. Their coats are spotted, but the spots disappear in twelve or thirteen weeks.

Except in late spring and summer, Wapiti are restless, roving animals. Their migrations vary in different places both in regard to distance and to time. In the old times, before they had been molested by man, herds were known to travel as far as 200 miles. The Wapiti in the Yellowstone National park migrate south every winter to Jackson's Hole.

Photograph by H. N. Stabeck

ELK AT HOME

The Elk enjoys a timbered country such as this, where it may obtain both protection and food

The Wapiti has been described as " the most omnivorous of the vegetarians." It both browses and grazes, eating grasses, leaves, and especially the buds and tender shoots of deciduous shrubs. It is fond of the water, and is equally at home among the high mountains, in the deep forests, and on treeless plains.

The economic value of the Wapiti as a food animal has not hitherto been sufficiently appreciated. It is easily domesticated, becoming in three or four generations " as gentle as sheep that run wild." It is less nervous and more easily confined than the ordinary deer. Given suitable State regulations for killing and marketing, elk venison could be raised more cheaply than beef, mutton, or pork. A cow Wapiti yields a considerably larger percentage of dressed meat than cattle. But the existing regulations are prohibitive of successful elk-raising. In some States the railway companies are precluded from carrying venison at all except in the open season; and persons who keep deer in confinement are subject to a tax, and if they wish to kill one of their own animals have to pay a fee before the State accords the privilege of slaughtering. The foregoing opinions are those generally held by men who have raised Wapiti successfully, so far as increase of the herds is concerned; and as the venison is admitted by scientific experts to form a highly nourishing article of diet, it is to be hoped further legislation may result in the establishment of a new and useful industry.

The Wapiti has often been trained to run in harness, and " trotting elks " have frequently been a feature of county fairs. Some years agc Mr. W. H. Barnes, of Sioux City, " drove a pair of Wapiti to a light wagon, and trained one to dive into a pool of water thirty feet below."

The natural gait of Wapiti is a walk. They trot with a long, graceful stride, and seldom break into a gallop unless much alarmed; but they cannot sustain the latter gait for any great length of time.

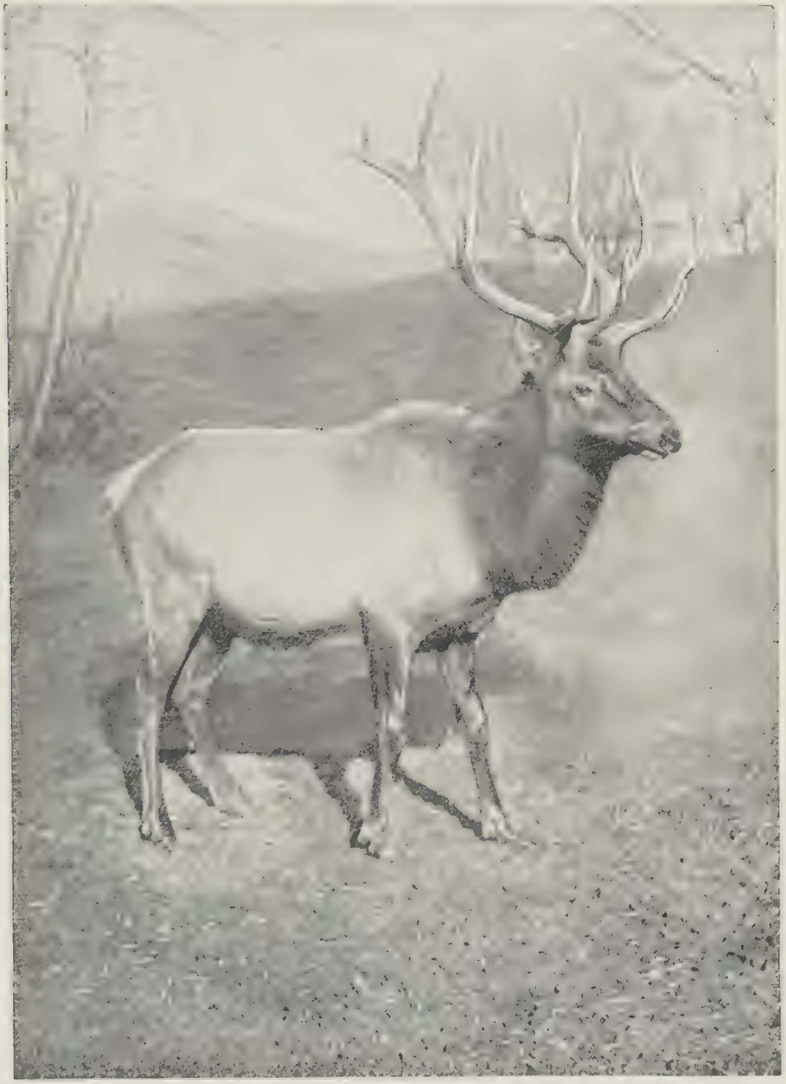
" Wapiti are extremely graceful creatures; their every move is the poetry of motion," says Singer. " I call to mind an especially beautiful scene. On the brow of a hill, silhouetted against the sky in the early dawn, fed a large band of Wapiti. First came the cows and calves, with their long, slender legs, small, well-formed heads, big ears and coats that glistened like satin in the early light. At the rear strode the ruler of the band, a fine, lordly stag. What a splendid picture they made, sharply defined against the tinted sky! "

The same sportsman gives the following vivid picture of a battle royal between two bull elk: " Up the mountain he came, the second stag who elected to do battle. Defiant and mad all through stood the big fellow up the slope, under the big spruce. But now, as his wrath grew with each approaching step of the bold intruder, he at last broke his wonderful pose, stamped his hoof in furious rage, and roared a threatening challenge to his foe. What the intruding stag lacked in stature he seemed to more than make up in courage, for he showed no intention of being turned aside by anything less than a battle ending in his defeat.

" What looked to be twenty feet was all that now intervened between the two great lords of the wilderness. Then, as if by silent command, the battle was on. With heads lowered between their forefeet the two adversaries walked around, waiting for an opening. Suddenly there was a savage rush, and as they met their antlers came together with such terrific force that their forefeet were raised from the ground. Slowly retreating, bellowing and threatening in a paroxysm of rage, they again circled around. Then came another charge, even more savage than the first. The intruder, or challenging bull, seemed to be doing most of the offensive fighting.

"At length he appeared to be weakening. Once when they came together he went to his knees. Finally he backed off; it was plain that the daring young bull had been worsted. Still ugly and bellowing he sullenly moved off, turned down the mountain and passed into the shadows of the gathering gloom."

Mr. George Bird Grinnell has also given us an excellent pen picture of an elk herd: "From a distant ravine comes the shrill, sweet whistle of a great bull elk as he utters his bold challenge to all rivals far and near. You can see him plainly as he walks out from the timber and slowly climbs the hill, followed by the group of watchful cows; and he is a splendid picture. Short-bodied, strong-limbed, round and sleek-coated, he is a marvel of strength if not of grace. His yellow body is in sharp contrast with the



Photograph by W. Rau

WAPITI

The distinctive dark coloration of the head, neck, and chest are here well displayed

dark brown head and mane, and the hugely branching antlers, wide spread and reaching far back over his shoulders, seem almost too much for him to carry; so that as he marches along with ponderous tread each step seems to shake the earth. At intervals he throws back his head and utters a wild call, and before its first notes reach the ear you can see the white steam of his breath as it pours forth into the frosty air. His cows feed near to him as he steps along, or if one straggles too far, he moves slowly toward her, and shaking his mighty horns warns her to return. If you fire a shot at one of that band, speedily the old bull will show himself the herder and protector of his family. Rushing about from point to point he will gather up cows and calves into a close bunch and will drive them off over the hills, threatening the laggards with his horns and using them too with cruel effect if the cows do not hurry. No chivalry this on the part of the old bull — he drives them forward not because he wishes to protect them from death, but because the cows are his, and he does not intend to be robbed of his wives and children."

Among the lesser known species of this animal are: the *Western Wapiti,* which is found in the Far West, and differs from the accepted type by being darker in color; and the *California Wapiti,* a very rare animal which is much smaller and paler in color. The *Merriam Elk* of New Mexico and Arizona is also a varying type that has become extremely rare.

VIRGINIA DEER

Odocoileus americanus *(Erxleben)*

Other Name.— White-tailed Deer.

General Description.— A fairly large Deer, the male with deciduous antlers, female lacking antlers. Tail long for a Deer, rather bushy and conspicuously white on the underside. Antlers moderately large and branching, directed forward, no brow tines. Color reddish-brown.

Dental Formula.—Incisors, $\frac{0-0}{3-3}$ Canines, $\frac{0-0}{1-1}$; Premolars, $\frac{3-3}{3-3}$; Molars, $\frac{3-3}{3-3} = 32$.

Pelage.— ADULTS: Color of sexes similar. *Summer.* Body color reddish-brown, with belly, underside and tip of tail, inside of legs, and throat patch white. Band across nose and ring about eye whitish. Spot on each side of nose blackish. Upper surface of tail dusky. *Winter.* Body color grayish to grayish-brown. Hair long and somewhat brittle in character. YOUNG: Reddish-brown or rufous with white spotting, the spots persisting until the fourth or fifth month.

Measurements.— Length, male, 5 to 5½ feet. Tail 12 inches. Height at shoulder 3 feet. Female somewhat smaller. Weight, male, 225 to 300 pounds.

Range.— From Atlantic seaboard to the Great Plains and from the Gulf to about 43° north.

Food.— Grasses, leaves of shrubs and trees, mast and aquatic plants.

Remarks.— The best known of the American Deer. A number of varieties have been described which differ from the above mainly in minor details.

RELATED SPECIES

Virginia Deer, or White-tailed Deer.— *Odocoileus americanus americanus* (Erxleben). The typical animal. The middle and eastern United States and Canada.

Northern Virginia Deer.— *Odocoileus americanus borealis* Miller. Larger and grayer. Northern part of United States and southern Canada west to Rockies.

Louisiana White-tailed Deer.— *Odocoileus americanus louisianæ* (G. M. Allen). Pale and with slender skull. Louisiana and Gulf States.

Plains White-tailed Deer.— *Odocoileus americanus macrourus* (Rafinesque). Pale than the typical form. Upper Mississippi Valley.

Texas White-tailed Deer.— *Odocoileus texanus* (Mearns). Size small, color pale, legs short. Rio Grande region of Texas.

Florida White-tailed Deer.— *Odocoileus osceola* (Bangs). Size of Texas Deer, but much darker. Florida.

Sonora White-tailed Deer.— *Odocoileus couesi* (Coues and Yarrow). Paler and smaller than typical *americanus.* Weight of adult buck about 80 pounds.

Douglas White-tailed Deer, or Oregon White-tailed Deer.— *Odocoileus leucurus* (Douglas). Lacks black markings; has more white. Oregon.

The Virginia, or White-tailed Deer, commonly known among sportsmen as the "White-tail," is the most widely distributed game animal of the United States; it was the first kind of Deer killed for food by the early settlers on the Atlantic coast; and the prophecy has been made that "it will also be the last of the large hoofed animals of North America to become extinct." Related species range from Canada and New England, as far south as Texas. Thanks to the

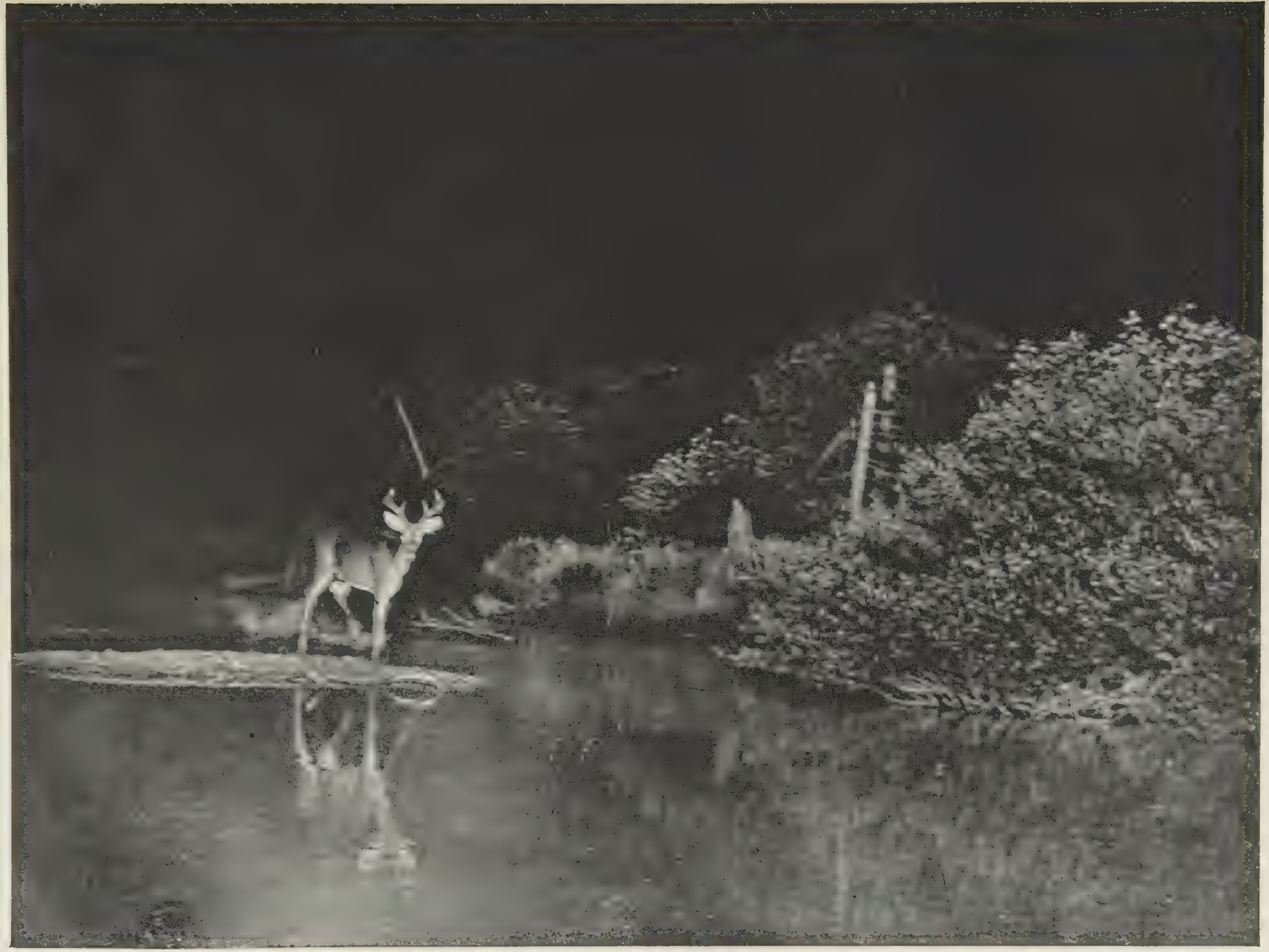


Photo copyright by L. D. Sherman

A WHITE-TAIL BUCK SURPRISED

Photographed at night by means of a jack-light at Connecticut Lakes, New Hampshire protection afforded by State game laws, the Virginia Deer is probably more numerous in New England and in New York State than it was thirty years ago. Its prolonged existence in a wild state has been accounted for by some mainly by "the fact that it is an inveterate skulker, and fond of the thickest cover. Accordingly it usually has to be killed by stealth and stratagem."

A fairly large White-tail measures five feet in length, and three feet high at the shoulders, and weighs a little over 280 pounds. The antlers differ from those of most other Deer in pointing forward as they rise, a short distance from the forehead. They rarely exceed twenty-nine inches in length.

As might have been expected, the great differences in climate and habitat induce many changes of habits. For instance, in the North the mating season is October or November, and the fawns are born in May or June. In Louisiana the season begins in June or July, and the fawns are born in January or February. Each doe has usually but one fawn each year; it is fifteen and one-half inches high, and its weight is about four and one-half pounds. Again, in the Louisiana marshes the White-tail live in the same locality throughout the year; but in the Adirondacks the Deer change their habits with the seasons. "Soon after the fawns are born they come down to the water's edge, preferring the neighborhood of the lakes, but also haunting the stream banks. The next three months, during the hot weather, they keep very close to the water. Where they are much hunted, they only come to the water's edge after dark, but in regions where they are little disturbed they are quite as often diurnal in their habits. . . Before September the Deer cease coming to the water, and go back among the dense forests, and on the mountains. There is no genuine migration, as in the case of the mule-deer, from one big tract to another, and no entire desertion of any locality."

Photograph by R. R. Raymond, U. S. A.

WHITE-TAIL FAWN

The fawns of the White-Tail Deer are particularly beautiful animals, and may be readily tamed. This was a wild one "snapped" in the open with a small folding camera

With the exception of the Adirondacks, Maine has the greatest number of Virginia Deer today, and this notwithstanding the fact that several thousand are killed annually by hunters holding the permits of the State.

The White-tail is exceedingly graceful when in motion. One enthusiastic sportsman writes of it: " The White-tail moves with an indescribable spring and buoyancy. If surprised close up, and much terrified, it simply runs away as hard as it can, at a gait not materially different from that of any other game animal under like circumstances. . . But normally its mode of progression, whether it trots or gallops, is entirely unique. In trotting, the head and tail are both held erect, and the animal throws out its legs with a singularly proud and free motion. . . In the canter or gallop, the head and tail are also held erect, the flashing white brush being very conspicuous. Three or four low, long, marvellously springy bounds are taken, and then a great leap is made high in the air, which is succeeded by three or four low bounds, and then by another high leap. A White-tail going through the brush in this manner is a singularly beautiful sight."

No animal does better in captivity than the Virginia Deer. It feeds on almost any kind of vegetable. Lichens, mosses, fallen leaves, lily pads, acorns, beechnuts, chestnuts, and other mast, all go to make up its dietary. Add to these a good supply of running water and access to rocksalt, and the White-tail menu is complete. Except the goat, no animal requires so little attention. It is a prolific breeder. One buck is assigned to twelve does. The does begin breeding at seventeen months.

There are several related species of this Deer, but the slight differences in size or marking can usually be traced to environment. Commenting on this fact, Mr. Archibald Rutledge says (in *Field and Stream*):

YOUNG WHITE-TAIL DRINKING

Interesting snapshot of a young White-Tail, taken after dark with the aid of a flash-light

" The Virginia, or White-tail Deer is of very wide distribution in America, and it is perhaps better known and loved than any of our game animals. Yet, since, as is the case with all wild creatures, its environment has considerable to do with the nature and habits of the White-tail, those who know it best in one locality are unfamiliar with its manner of life in another. The White-tail of the Florida Everglades is, in many ways, very different from the Deer of the Adirondacks and those of the big Allegheny mountains. . . . For many years I have been acquainted with the White-tailed Deer as it is found in the South, particularly in the great pine barrens and tupelo swamps of the Carolinas. There are few essential differences or peculiarities of the Deer of the South. As a rule they are smaller, sleeker creatures than those of the North, more graceful, too, and their coloring is lighter. It is very seldom, indeed, that a buck in the Carolinas will run 175 pounds. On the other hand, the antlers of the southern Deer are superior in beauty and symmetry, to, for instance, those of the Deer of the western Pennsylvania mountains. Recently, on a visit to a taxidermist's shop in that State, I examined the heads of twenty-six bucks, and but one pair of horns could be called fine in their size and symmetry. The others were bent, crooked, knotted and generally misshapen. The same condition was true at another time when I examined the antlers of nineteen bucks. However, a perfect Deer head of the North is a more splendid trophy than one of the South, the antlers have a larger beam, longer tines, and a wider spread. Their whole appearance is more picturesque and rugged. I take this difference in horns to be largely due to the fact that northern Deer are, for the most part, creatures of the mountains or of rough country. Their paths are up and down hill, along steep declivities, and through dense areas of second-growth sprouts. Of necessity, their horns get rough treatment; and when they are in the velvet, a rap or a push or a pull will mean, later in the hardened antler, some decided blemish. In the level, open woods of the South, it is only by singular mischance they are found with parts broken clear off, probably in a clash between rival bucks, but as a rule their development is normal and very graceful.

Photograph by C. E. Salter

TEXAS WHITE-TAIL FAWN

The fawns of the White-Tail group are beautifully spotted

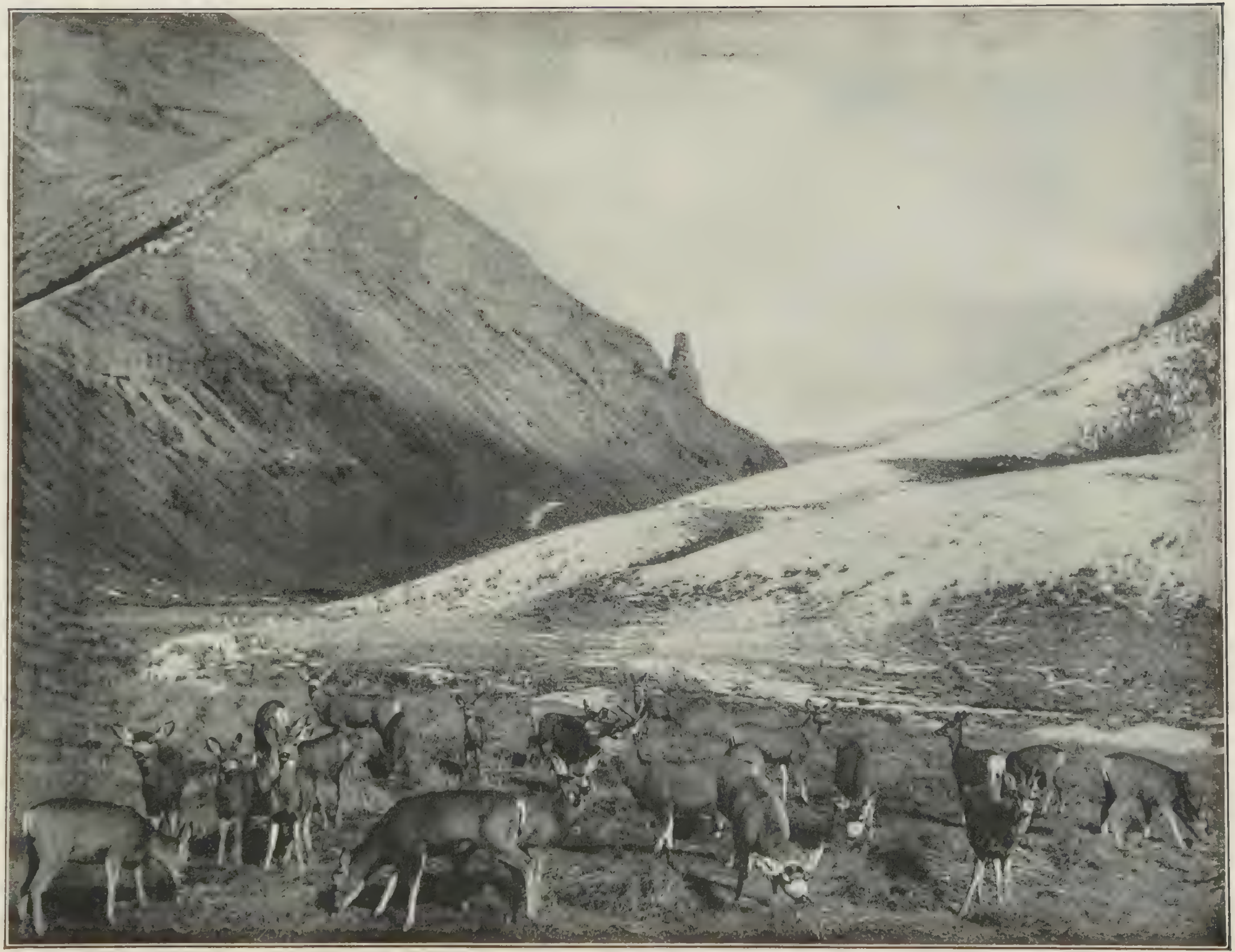
"I believe the Deer of the South are more gregarious than those of the other localities. When unmolested, they herd readily. Of course, in the mating season, extending through the autumn and the early winter, a buck will nearly always be found with two or three does. On four or five occasions I have seen a buck at that season with four does. But this gathering is not gregarious. At other times, in the great pine woods and swamps of the South, Deer are found in large families, and even where they are hunted a good deal, they are fond of running together. I have seen as many as eleven in such a drove, while a herd of six or eight is no uncommon sight. However, during the autumn and winter, deer of widely different ages do not consort; it is unusual at that season to see a fawn of the same year; certainly they do not associate with the bucks and does which are then mating. During a two days' hunt I have seen twenty or more Deer, everyone of which appeared large. The growing fawns are evidently dissociated from the older Deer during this season.

"If permitted to live out their lives, Deer will probably go from twelve to fifteen years. But one seldom sees a Deer as old as that. There is a scourge called the Black Tongue which comes through the southern woods periodically — generally every six or seven years. This dread disease pitifully depletes the ranks of the White-tail. Its symptoms are those of a galloping consumption, and I have no doubt that is a form of virulent tuberculosis; fever, ague, inertia, and general wasting away are some of its fatal signs. Negro turpentine workers have often told me of coming on Deer thus stricken; at which times they made no effort to clear themselves. I myself have never seen a Deer sick in this way, but I have ridden the woods after the plague had passed, and I have seen many that had perished by reason of it. Of course, there is no practical way of ministering to creatures so wild and shy, even if their disease were amenable to the skill of medicine, because for every Deer which is found sick, a score have died obscurely.

"The age of a buck greatly affects his appearance. Except in size, weight, and color-shadings, does have no decided marks of age. But the appearance of a buck's neck and head, the form of his hoofs, and the size or symmetry of his antlers will supply definite data concerning his age. It is far from true that the oldest bucks will have the finest horns. I have known bucks which must have been ten years old to have antlers which were decidedly inferior in form and size. On St. Katherine's Island, off the Georgia coast, a friend of mine killed a buck which he declared was so old that it was actually decrepit. The Deer was decidedly gray in color, and its movements had lost nearly all the natural buoyancy of the White-tail. His horns were quite small and crumpled. . . My experience has been that a buck is in prime antler at from six to nine years, and that a six or seven-year-old buck carries the best horns. As a rule, bucks two and a half years old have two prongs, or, as they are reckoned in some States, a beam and a prong. But I have seen bucks of that age with nothing but very long spikes, somewhat resembling Antelope horns. I have also seen a buck with spike horns, fifteen inches long, which met in front, so great was their curvature inward, nor was there any sign to show that the antlers had been forced into that position. It was apparently a natural but an extraordinary growth."

YOUNG VIRGINIA DEER

This photograph was taken from a boat after dark, with the aid of a flash-light



Copyright, by L. A. Myrick

MULE DEER

This herd was photographed from a sage brush blind, while feeding near Grand River, Colo., by L. A. Myrick

MULE DEER

Odocoileus hemionus (*Rafinesque*)

General Description.— A moderate sized deer, with robust antlers and large ears. Tail covered with short hairs, naked on underside and with a black terminal tuft. Metatarsal gland unusually large. Body color yellowish-brown to reddish-brown. High bounding gait. Antlers never developing as many tines as with the White-tailed Deer, but dividing on each beam into two characteristic Y's.

Dental Formula.— Same as given for White-tailed Deer.

Pelage.— ADULTS: *Summer.* Yellowish-brown varying to reddish-brown above. Below blackish. A large patch on rump and surrounding tail dull white. Tail light color of the rump above, terminal one-third black above and below, the hairs forming a tuft or pencil. Inner ear grayish-white, externally same color as head and body. *Winter.* Dark gray above, otherwise about as in summer. YOUNG: General color brownish-yellow irregularly spotted with dull white.

Measurements.— Length, male, 5 feet, 3 inches; tail, 7¼ inches; hind foot, 18½ inches. Height of ear above crown, 9½ inches. Length of female, 4 feet, 9 inches. Weight of average buck, 150 to 200 pounds.

Range.— Northern Arizona to British Columbia in the mountains, foothills and plains.

Food.— Twigs and foliage of shrubs, grass, fruits and plants, and in southern part of range, acorns.

Remarks.— A very different sort of an animal from the Virginia Deer both in appearance and habits. The ranges of these two animals overlap in the Great Plains and in the Rockies as well as in the southern United States, but on the whole they inhabit widely separate areas. The Mule Deer varies in a few characters such as coloration and size, to produce several closely related forms.

RELATED SPECIES

Mule Deer.— *Odocoileus hemionus hemionus* (Rafinesque). The most widely spread form. Found throughout the Great Plains and the adjacent Rockies.

California Mule Deer.— *Odocoileus hemionus californicus* (Caton). Considerably smaller and more tawny. A dark stripe from back along upper surface of tail. Southern California and northern Lower California.

Mexican Mule Deer.— *Odocoileus hemionus canus* Merriam. Smaller, paler and grayer. Texas, New Mexico and Arizona from the deserts up into the mountains.

Burro Deer, or Desert Mule Deer.— *Odocoileus hemionus eremicus* (Mearns.) Very pale, large, with heavy horns. Western Desert Tract of the United States.

Next to the Wapiti and Moose, the Mule Deer is the largest of our American Cervidae. Its limbs are larger and coarser than those of the White-tailed Deer, and it is less agile and elastic in its movements; also less graceful in form. The large disproportioned ears very probably suggested the name of Mule Deer. The most striking difference between the White-tailed Deer and the Mule Deer is found in the antlers. With the Mule Deer the tines from the main beam divide to form two Y's on each beam, whereas in the White-tailed Deer, the tines from the main beam seldom divide.

The Mule Deer was first discovered by Lewis and Clark on September 18, 1804, in latitude 42°, on the Missouri river. They then called it the Black-tailed Deer. On May 31, 1805, they discovered the true Black-tailed Deer, on the Columbia river.

The Mule Deer is considered one of the most imposing of the Cervidae in appearance. It holds its head and neck erect, while its antlers are much wider than those of its white-tailed cousin. In winter its color is a sober gray, changing in summer to soft brown, thus enabling it to blend in with the landscape to a remarkable degree.

This animal is at home in the wildest, roughest and most mountainous country. It frequents both the deep ravines and the mountain heights. "It is a proud-spirited, high-headed animal," says Dr. Hornaday, "a bold traveler, and, like the Mountain Sheep, is often found where the scenery is wild and picturesque. In this respect it differs from the White-tailed Deer, which prefers low ground, and either brush or timber in which to hide."

A large Mule Deer buck, shot by Dr. Hornaday on Snow Creek, Montana, measured forty-two inches high at the shoulders and sixty-two and six-tenths inches in length. A large pair of antlers showed a beam length of twenty-seven and one-quarter inches, spread twenty-nine inches, and had fourteen points. In the United States the present scarcity of really large antlers in the possession of taxidermists is a sure sign of the approaching end of this species.

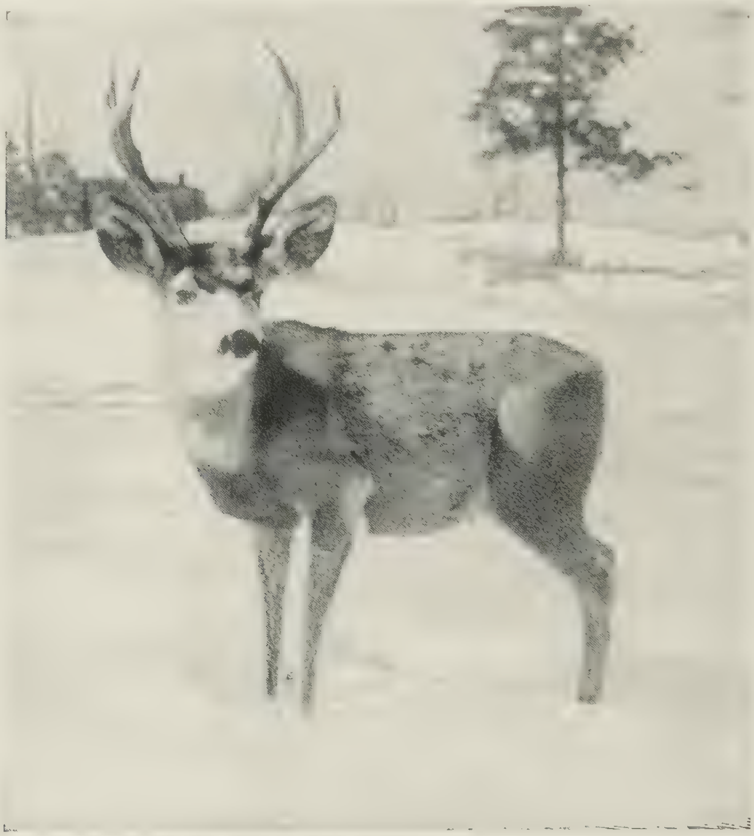
In 1903, Mr. A. G. Wallihan, a photographer of wild animals, made the following prediction regarding the extermination of the Mule Deer in Colorado, its centre of abundance in the United States: "Unless we have a close season on Deer, five years will see the finish of these animals. Five years would give them a good start again. I will cite you some figures: In 1897, I was on the big trail here for nine days, and I counted within a few of a thousand Deer. In 1901 I was on the same trail for eighteen days and I counted 228 Deer. In 1902, I was out fourteen days, and counted fifty-two Deer."

The Mule Deer has a peculiar running gait — a progression of stiff-legged leaps, in which the feet come down together to the ground then bound off again like steel springs. But it can run at astonishing speed for long distances. In the chase it will tire out most dogs and wolves. In the Rocky Mountains, where the true Black-tailed Deer is not known, the Mule Deer is still referred to as the Black-tailed. On the Pacific Coast, where it is found on the same range as the Columbia Black-tailed Deer, it is known by its true name.

The most natural home of the Mule Deer is in the mountains, but before the occupation of the country it frequented the Great Plains. West of the Rocky Mountains this species of Deer is still met with in many localities. In the coast range north of San Francisco it is almost entirely replaced by the Columbia Black-tailed Deer. In Oregon, Washington and British Columbia the Mule Deer is not so numerous as in the Rockies further east.

This Deer may produce two fawns at each birth, but in past years its breeding has nowhere near kept pace with the rate of killing, and it seems doomed to extinction.

The Mule Deer was one of the strange animals noted by Audubon and his companions on their memorable journey up the Missouri river, in 1843. He says of his first sight of it: "On winding along the banks, bordering a long and wide prairie, intermingled with willow and other small brushwood, we suddenly came in sight of four Mule Deer which, after standing a moment on the bank and looking at us, trotted leisurely away, without appearing to be much alarmed. After they had retired a few hundred yards, the two largest, apparently males, elevated them-



By permission of the New York Zoological Society

MULE DEER BUCK

Showing the distinctive marking of the crown and muzzle of this species

selves on their hind legs and pawed each other in the manner of the horse. They occasionally stopped for a moment, then trotted off again, appearing and disappearing from time to time, when becoming suddenly alarmed they bounded off at a swift pace until out of sight. They did not trot or run as irregularly as our Virginia Deer, and they appeared at a distance darker in color."

Mr. A. G. Wallihan says of this species: "For me, at least, there is a charm about the Mule Deer that no other game possesses. Barring the Bighorn, their meat is the best, their hide tans into the best buckskin, and you turn from the large Elk or the agile Antelope to the graceful beauty of the Mule Deer buck, and find there the greatest satisfaction. The head of the Bighorn is a finer trophy, no doubt, and you are led to grand scenery in the pursuit of him, but it is heart-breaking work. Where you find the Mule Deer you will find other pleasures, for he delights in the most charming bits of country to be found. He will jump up from the tall weeds and grass among the aspens, so close as to startle you as you ride through them, or will leap into view from the shade of a deep washout far in the desert, where he finds in the feed and surroundings something to suit his taste. He is crafty also, for if he thinks he is hidden I have known him to lie in thick bush until almost kicked out, after all sorts of experiments to drive him out have failed. He has perhaps the keenest scent and the best hearing of all the Deer tribe, but cannot see as well as the Antelope, for I have stood within ten or twenty feet of several passing bands, which failed to distinguish me from a stump or rock. Antelope will approach very close occasionally, out of pure inquisitiveness, but never a Deer. If anything moves, a Deer sees it instantly, but he cannot tell the nature of a still object. This often places him at a decided disadvantage."

Photograph by Mrs. Howard A. Colby

AN EARLY BREAKFAST

White-tailed Deer, on the shore of Umbazookakus Lake, Maine. Time exposure with a telephoto lens, at five o'clock, on an August morning

COLUMBIA BLACK-TAILED DEER

Odocoileus columbianus (*Richardson*)

General Description.— A large Deer with heavy antlers on the male. Tail longer than that of Mule Deer and much broader. Ear normal. Body and legs short. Body color yellowish-red.

Dental Formula.— Same as given for White-tailed Deer.

Pelage.— ADULTS: *Summer.* Above, yellowish-red to dull reddish-brown. A dark streak on throat, darkening on the breast and becoming brownish on the belly. A white area extending from between the thighs to the tail. Tail with upper side brown on basal half, dull black on remainder, and white on under side. *Winter.* Above, gray tinged with tawny, darker on upper side of neck. YOUNG: Bright bay spotted more or less regularly with white.

Measurements.— Length, 6 feet; tail, 6 inches; height at shoulder, 2 feet, 10 inches.

Range.— Coast Mountains from northern California to British Columbia.

Food.— Grass, leaves, buds and twigs of shrubs and trees.

Remarks.— The Columbia Black-tailed Deer may be readily distinguished from the Mule Deer by its smaller ears, smaller metatarsal gland (2 to 3 inches long in the Black-tail, 5 inches long in the Mule Deer), and longer, broader tail with a white underside and no naked area. The group of Deer, of which the Columbian Black-tailed is typical, is made up of 4 species and subspecies.

RELATED SPECIES

Columbia Blacktailed Deer.— *Odocoileus columbianus columbianus* (Richardson). Type form. Coastal region from California to British Columbia.

Southern Black-tailed Deer.— *Odocoileus columbianus scaphiotus* Merriam. Ears larger and broader, color paler, teeth larger. Southern California.

Alaska Black-tailed Deer.— *Odocoileus columbianus sitkensis* Merriam. Alaska.

Crook Black-tailed Deer.— *Odocoileus crooki* (Mearns.) Smaller, paler and ears larger. New Mexico and Arizona.

This deer, the most common on the Pacific slope, was discovered by Lewis and Clark in 1805, when in the region of the Columbia river, and is described in their list of fauna observed by them as the "Black-tailed Fallow Deer." It is remarkable for having the most limited range of all the Deer of America, being found in British Columbia and on the Pacific Coast only. In southern Oregon it has been seen a few miles over the crest of the Cascade range, as far east as Klamath Lake, and in most abundance about forty miles east of Cottage Grove.

The Columbia Black-tail is generally smaller than the two other types. Its ears are large, and its eyes are perhaps the most beautiful of all the Deer family, being large, and a brilliant liquid black. The weight ranges from 175 to 225 pounds; an exceptionally large buck scaled over 270 pounds. The antlers, which are neither so large nor so handsome as those of the Mule Deer, vary considerably in size; a pair twenty-three inches long and having a spread of twenty-four inches would be considered good. They are bifurcated sometimes once, sometimes twice, and are shed annually in the spring. Forthwith the bucks make their way to the higher mountains remaining in the thick brush for five or six weeks, in which short time the new horns attain their full growth, but are, of course, still in the velvet. The Indians are said to be fond of the soft horn, and hunting dogs must be kept from it, as they regard it with evident liking.

In winter, the color of the animal is a beautiful steel-gray, the face being gray with dark forehead; the throat and underparts are white, and the legs dark cinnamon. The tail, which is the distinguishing feature of this species of Deer, is round, and a dull black, except for about a quarter of its circumference on the under side, which is white. As the tail of the Mule Deer is also black, hunters not infrequently mistake that animal for the Columbia Black-tail; but there is this distinct difference between the two: the tail of the Mule Deer is naked underneath, while that of the Columbia Black-tail is entirely covered with hair.

The mating season is from late September to November, the actions of the bucks at this time being almost ludicrous. "With bulging eyes and widespread legs, they plunge through the forest as if possessed of an unclean spirit — hardly noticing even a hunter when they meet him, or, if they should do so, plainly showing that they would almost as soon fight as flee." The does are very prolific, producing, in the spring, two, and not uncommonly three fawns at a birth. The fawns are beautifully marked with almost white spots, which they retain for four or five months. So long as the does are nursing, the Deer lie very close, but the bucks do not appear to trouble themselves much about the welfare of their offspring.

The Columbia Black-tail is a cautious and wary animal in the forest and where much persecuted, but where unmolested it is exceedingly tame. When chased, however, it tests all the ingenuity of the practiced hunter, and in "dodging into unsuspected ravines, twisting around big rocks, and dashing over logs, the Black-tail is equalled only by the Mule Deer."

Photograph by E. R. Warren

MULE DEER

A handsome, well-proportioned species noted for its fine antlers

While not strictly nocturnal, this Deer is a night rover and loves a good moon. It then can get all the exercise it requires before daylight, and lies down during the day. It cares little for grass, but delights in the tender twigs and leaves of the huckleberry, salal, and in evergreen foliage generally. In the natural park at Vancouver it has been seen to feed on "the foliage of spruce, Douglass fir, and juniper in succession," and where little molested it has been known to go down to the shore to feed on a certain kind of seaweed. In many of its haunts the browse is so succulent that the animal can go for days without drinking.

An interesting fact has been noticed respecting this Deer in the region of the Cascade mountains, in Oregon. A large number migrate every spring to the high mountains, returning thence before the snow begins to get deep; the others remain all summer in the Coast range, and the condition of both bands is equally good. Like the Moose and Wapiti, the Columbia Black-tail "yards" in the winter, and the Indians, taking advantage of this fact, slaughter it in great numbers, especially in the region of the Bitter Root and Coeur d'Alene Mountains. The animal is now protected in all the States where found, and owing to the unfrequented nature of many of its haunts, it seems to be in no danger of extinction.

It should be mentioned that the Columbia Black-tail is a "bounding" Deer, that is, all of its four feet strike the ground together. This gait, which has earned for it in Manitoba the name of "Jumping Deer," has not changed in the last hundred years, Lewis and Clark having recorded that it "does not leap, but jumps like frightened sheep." It is a dangerous animal to approach when wounded. Mr. Thomas G. Farrell relates an experience of his in southern Oregon: "Poor H—— was hunting on the same ridge that I was on. I saw him fire at a buck, and as it fell, he laid down his gun, and drawing his knife, ran up to the animal to cut its throat. I shouted to him to be careful, at the same time making my way rapidly in his direction. My warning was too late, however, for, as he approached it, the buck suddenly rose to its feet, and, jumping against the hunter, hurled

BLACK-TAILED DEER

The Black-Tails have a general resemblance to the Mule Deer, but are a trifle smaller

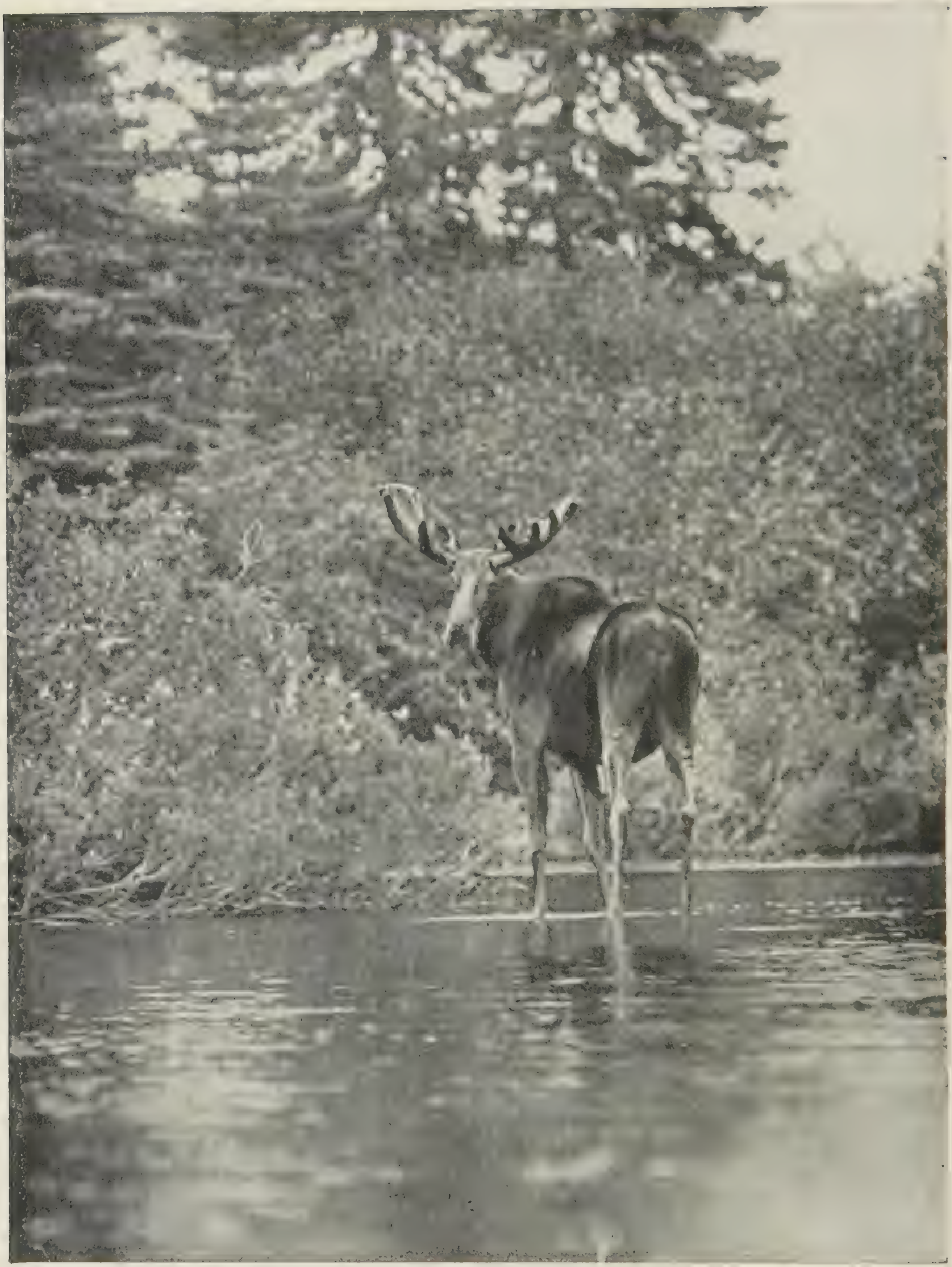


Photo copyright by Wm. Lyman Underwood

A BULL MOOSE SURPRISED

An unusual picture in which the photographer risked being charged upon by the unwilling model him to the ground. The next instant the animal bounded into the air, and came down with all four feet on the prostrate man. At this instant, one of the party fired at the animal and killed it. We had to carry the wounded man sixty miles on a stretcher, and he never fully recovered from his terrible experience."

In Alaska there is a smaller form of the animal known as the Sitka Deer, which is less in stature and has smaller antlers than even the Florida White-tail.

In southern California the related species is known as the Southern Black-tail. Its ears are larger and broader than those of its northern cousin, and its color is not so distinct.

In New Mexico and Arizona others are found of much the same marking as the southern. These are known as the Crook Black-tail Deer.

MOOSE

Alces americanus *Jardine*

General Description.— Largest of the American Deer. Antlers, on male only, excessively broad and heavy, palmate. Tail short. Muzzle inflated, broad and pendulous. Nasal pad haired except extreme lower portion. A hanging growth of skin and long hair, the bell, on throat. Higher at shoulders than at rump. Long pointed hoofs, well developed lateral hoofs. Color black or dusky. Ears large.

Dental Formula.—Incisors, $\frac{0-0}{4-4}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{3-3}{3-3}$; Molars, $\frac{3-3}{3-3}=32$

Pelage.—ADULTS: *Winter.* Sexes similar in color. General color from blackish-brown to black. Below same color as above, except for pale brownish-gray on lower belly. Lower legs brownish-gray. Varying amounts of gray on muzzle and face. Short hair over all the nasal region with the exception of a small triangular naked space between nostrils. *Summer.* Similar in pattern, but color somewhat lighter, and legs tawny gray. YOUNG: Reddish-brown, unspotted.

Measurements.— Male, length, 8½ to 9 feet; tail, 2½ inches; height at shoulders 5½ to 6½ feet; average adult spread of antlers, 52 to 58 inches; record heads, 65 to 78 inches. Female, about three quarters the size of the male.

Range.— British America and northern United States from Maine to the Rockies. Formerly south in New England to Massachusetts.

Food.— Foliage and twigs of shrubs and trees; aquatic plants.

Remarks.— The Moose of North America are forest inhabiting, water-loving animals, easily distinguished by their great size and peculiar characters from any other of the *Cervidae.* Three species are known.

RELATED SPECIES

Common Moose, or American Moose.— *Alces americanus americanus* Jardine. The typical animal ranging from the northern United States east of the Rockies north to Hudson Bay.

Shiras Moose.— *Alces americanus shirasi* Nelson. Smaller, with pale brown back, pale ears, and small hoofs. Wyoming, in the Yellowstone Park region, Montana and Idaho.

Alaska Moose.—*Alces gigas* Miller. Noticeably larger than the common form; blacker. Kenai Peninsula, Alaska.

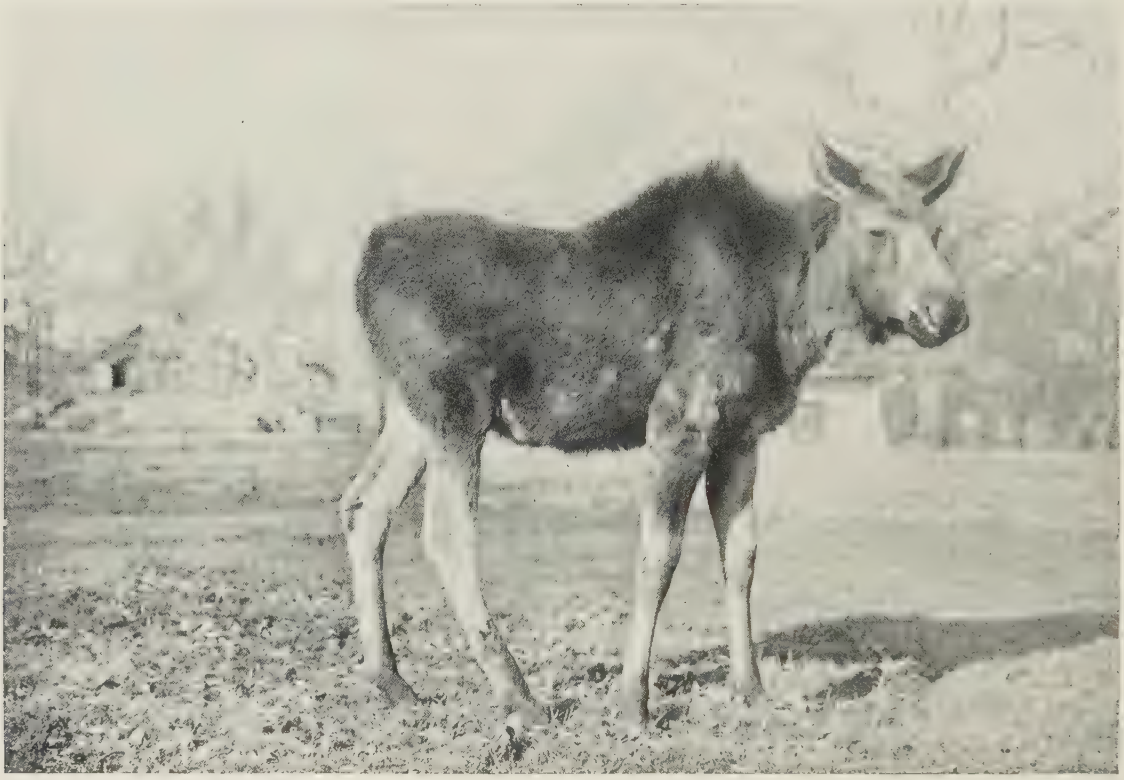
The Moose is the giant among Deer; the killing of one is the realization of the deer-hunter's highest ambition; and a head with its magnificent antlers is unexcelled as an interior decoration of the home, the club, or the hall. Those who have seen the animal only in our natural history museums or zoological parks can hardly realize the imposing appearance of an adult male "full of strength and purpose, striding like a four-legged Colossus through the evergreen forests of Canada or Alaska, or swinging away at incredible speed from the dangers of the chase." No other species of Deer roams through so wide an extent of forest country of the northern portion of the North American continent. From Alaska southward to Wyoming (in latitude 43°), and eastward through Canada, northern Minnesota, Maine, New Brunswick and Nova Scotia, the Moose in one or other of its species is to be found. In British Columbia, Washington, and southern and southeastern Alaska they do not approach the coast, but in the Alaska and Kenai peninsulas their range is down to the sea.

The Common Moose, which is now most numerous in New Brunswick, Maine and lower Canada, is not so large as his brother, the Alaska Moose of the Kenai Peninsula, so far as antlers are concerned. One of the tallest and largest moose ever killed and measured by reliable hands was a Common Moose shot in New Brunswick by Carl Rungius, the well-known animal painter. The measurements of this animal were as follows: Length of head and body, nine feet seven inches; length of head alone, two feet nine inches; height at shoulder, exactly seven feet; girth, eight feet. The antlers were somewhat small for so large an animal. Incidentally it may be stated here that the largest moose antlers known are in the Field Columbian Museum, Chicago, which gives their dimensions as: Widest spread, seventy-eight and one-half inches; palmation, greatest width, sixteen inches; burr, circumference fifteen inches; total number of points, thirty-four. They were those of an Alaska Moose from the Kenai Peninsula. An average specimen of the adult Common Moose stands about five feet, nine inches at the shoulders, and one over six feet would be a very fine animal. The weight of the male often exceeds 1000 pounds. The females are smaller than the males. In both, the nostrils are large, and the muzzle hairy and long.

In color the Common Moose is lighter in Maine and lower Canada than it is farther west. The head, neck, and body are blackish-brown; the legs and under parts yellowish-gray, and in some cases almost white. The hair is very coarse, and is six inches long on the neck and shoulders. From the neck depends a pouchlike piece of hair-covered skin, called the "bell."

The Common Moose is an ungainly creature. Its front legs are considerably longer than the hind ones, rendering its gait extremely awkward; but their length, quite four feet, enable it to stride with facility over fallen trees in the forest which prove annoying obstacles to its pursuers. Its overhanging, square-ended nose, large ears, and a hump on the shoulders, all add to its ungainliness. Its ordinary gait is a long, springy trot, but it will walk for long distances with great strides in a straight line across the marsh, splashing among the wet water plants, and ploughing through boggy spaces with the indifference begotten of vast strength and legs longer than those of any other animal on this continent.

The Moose is a browsing animal, its legs being too long and its neck too short to allow it to graze; yet in the early spring, when greedy for the tender blades of young, green marsh grass, the Moose will often shuffle down on its knees to get at them, and it will occasionally perform the same feat to get a mouthful of snow in



By permission of the New York Zoological Society

COW MOOSE

Neither sex of the Moose family can be called handsome, but of the two the female is the more gaunt and ungainly

winter. In Maine and lower Canada it feeds extensively in the summer on pond lilies and other plants in the marshy lakes; sometimes when feeding in a pond or lake it will go completely under the water and out of sight after its favorite lily root. In the forests it feeds on moss and lichens and on the twigs, leaves, and bark of certain trees, such as willows, alders, and aspens. It is a powerful swimmer, and is especially fond of wading in shallow water.

The Moose is usually monogamous, and the mating season begins in September. The bulls at this time become absolutely reckless, and do battle royal for possession of the cow. The clashing of their antlers may sometimes be heard a mile off. The bulls seek the cows, uttering continually a short, loud roar, which can be heard at a distance of two or three miles; the cows now and then respond with low, plaintive bellows. Hunters and photographers of the Moose summon the animal to them by imitating the call of the bull, on a horn made of birch bark. It has been a disputed question as to whether this call really deludes the Moose. The calves are born in May and usually remain with the cow till the second year. One or two at a birth is the usual number, very occasionally there are triplets.

An eye-witness to a fight between two bull Moose gives (in *Field and Stream*) the following vivid description of the contest: "For a brief space they eyed each other with lowered heads, pawing the ground savagely meanwhile. The great ears hugged the bristling necks. Slowly they approached each other like two trained wrestlers waiting for an opening. Suddenly the gray bull with lowered antlers charged at a distance of ten yards. The other, not a whit behind his rival in courage, sprang to meet the onslaught. So evenly matched were they in size and strength that at the terrific impact each was hurled back and almost upon his haunches. The gray Moose was the first to recover himself. Again their antlers crashed together, resounding far throughout the quiet moonlit woods.

"It now became a test of strength. The first to give way would surely lose the fight, for once started backwards his hinderparts would sooner or later come in contact with some obstacle that would cause him to swerve, when the other would have a chance at his unprotected side.

"The earth spurted up from their straining cloven feet, yet not a sound was made by either other than the tramping and labored breathing. With a deep knowledge of the game they strove to keep head-on. Around and around they struggled until the grass and leaves were trampled out of sight. At last in one of these evolutions the rump of the stranger struck against a tree, preventing him from swinging to keep in line with his antagonist. The neck muscles, though tremendously powerful, could not hold his adversary. He struggled to recover himself but without avail. The tree that had been his ruin prevented him from leaping sideways and thus escape the onslaught. The antlers of the gray Moose slipped around his neck, one of them catching him forward of the shoulder, and the other just back of it. With a surge the gray Moose drove his antlers home. Nothing that lived could withstand that fierce vindictive thrust. Through hair and hide and flesh those terrible points sank. The stranger reared to avoid the shock. That action, together with the tremendous lifting stroke, threw him with a crash full upon his back. As he went over the curved points ripped out of the wounds, lacerating the flesh. The lungs were pierced, but he struggled to his knees, and while in that defenseless position the gray Moose struck him full in the side in a maddened charge. As he made no motion to rise the gray Moose drew off and watched him for a moment, then turned to where the cow stood, who had been apparently an uninterested spectator of the fight."

Photograph by G. W. Visser

MOOSE SWIMMING

The Moose is not so pugnacious when in the water, and this one was snapped while busily getting away from a canoe

The Moose has several enemies, among them being the Bear, the Cougar (the most dangerous where both animals are at all plentiful), and the big Timber Wolf. Man, of course, is its most dreaded foe, though owing to the excellent game laws of many of the States, notably those of Maine, the Moose is now no longer in danger of extermination. It is hunted by several methods: calling (referred to above), still-hunting, fire-hunting from a canoe, and "crusting." The last two methods are considered unsportsmanlike. Crusting often degenerates into mere butchery, the animal breaking through the crust of snow and becoming helpless before its pursuers. Hunters who employ this method are often charged by Moose. They follow the animals on snowshoes during the late winter and early spring when the Moose have "yarded." A "yard," it should be explained, is a spot chosen by a Moose herd for their winter home because it contains plenty of browse and is sheltered from heavy snowdrifts. Across this space the Moose travel to and fro, making regular, beaten paths.

On the general question, "Will Moose attack man without provocation?" Colonel Roosevelt throws some light in an article in *Scribner's*, in which he says: "When half a mile from the landing we saw another big bull Moose on the edge of the shore ahead of us. We paddled up to within a hundred yards of it. Then it looked at us, but paid no further heed. We were rather surprised at this, but paddled on past it, and it then walked along the shore after us. Another hundred yards put us to windward of it. Instead of turning into the forest, when it got our wind, it merely bristled up the hair on its withers, shook its head, and continued to walk after the canoe along the shore. I had heard of bull Moose during the rut attacking men, but never of anything as wanton and deliberate as this action, and I could hardly believe the Moose meant mischief; but Arthur said it did; and obviously we could not land with the big, black, evil-looking beast coming for us. I was most anxious not to have to shoot it. The Moose turned and followed us, shaking his head and threatening us. As soon as we stopped, he rushed down the trail toward us, coming into the lake. Where the water was deep, we pushed the canoe in close to him, and he promptly rushed down to the water's edge, shaking his head and striking the earth with his fore hoofs."

COW MOOSE

This Cow was lured to within fifteen feet of the camera by the operator, who grunted like a Bull Moose

For more than an hour the animal prevented the occupants of the canoe from landing; then he galloped — not trotted — away. A couple of hundred yards on, the beast reappeared, and after firing over its head without scaring it in the least, the Colonel " put a bullet into his chest. It was a mortal wound and stopped him short. I fired into his chest again. He turned and recrossed the stream, falling at a third shot; but as we approached he struggled to his feet, grunting savagely, and I killed him as he came to us."

In forest preserves the Moose will thrive, but in zoological parks it seldom survives longer than five or six years, usually dying of some affection of the stomach and intestines, although fed on " the best tree branches that its own native forests can supply." It is docile in captivity and has been trained, like the Wapiti, to run in harness.

By permission of the U. S. Biological Survey

Drawing by Carl Rungius

ALASKA MOOSE

The Alaska Moose is the largest of its tribe. This spirited drawing shows a characteristic attitude

The Alaska Moose differs from the better known form by being larger and darker in color. This animal reaches proportions almost gigantic, and when at bay in the woods is a foe to be dreaded. Its home is the Kenai Peninsula of Alaska.

" The broad valley and mountain banks of the Klondike," writes Tappan Adney, " are an admirable feeding ground for this Moose. The temperature in winter is exceedingly cold and crisp, but the snowfall is light, and by reason of the intense cold the snow does not settle or pack. There is so little wind, especially through the early part of the winter, that the snow accumulates on the trees in strange and often fantastic masses, giving the landscape, especially on the mountain tops, the appearance of having been chiseled out of pure white marble. On account of its lightness, the snow is no impediment to the long-legged gaunt Moose, which is not obliged to 'yard' as in more southern deep-snow regions, but wanders at will from valley to mountain top in search of the tender twigs of willow, white birch or cottonwood. The Indians surround the Moose in its feeding grounds and as it runs, one or more of them is tolerably sure of a quick shot." The Moose in this section have long been the main support of the Indians, and in their household economy no part of the beast is wasted. To quote further: " The hides were brought indoors, the hair was shaved off, and all the sinew and meat adhering was removed by means of a sort of chisel made of Moose's shin bone. . . . The skin was now washed in a pan of hot water. The various portions of the Moose were divided among the village. One family got the head, another a slab of ribs, another the shoulders. The shin bones were roasted and cracked for their marrow; the ears, although nothing but cartilage, were roasted and chewed up; the rubber-like 'muffle' or nose, and every particle of flesh, fat or gristle that could be scraped from head or hoofs were disposed of. Even the stomach was emptied of its contents, boiled, and eaten."

A near relative of the Alaska Moose is found in the forests of the Scandinavian Peninsula, as well as parts of Russia and Prussia. The animal is known to the English by the name of Elk, which term has unfortunately been applied in this country to the Wapiti, an animal presenting many points of difference.

WOODLAND CARIBOU

Rangifer caribou (*Gmelin*)

Other Name.— American Reindeer.

General Description.— A large Deer, the male weighing about 300 to 400 pounds. Antlers palmate, found on both sexes, those of male wide and branching, of female much smaller, occasionally lacking entirely. Brow tine present, compressed laterally. Muzzle haired, wide and heavily built. Ears and tail short. Mane on neck. Tarsal but no metatarsal gland. Hoofs broad and long, deeply cleft, with accessory hoofs reaching nearly to ground.

Dental Formula.—Incisors, $\frac{0-0}{4-4}$; Canines, $\frac{1-1}{0-0}$; Premolars, $\frac{3-3}{3-3}$; Molars, $\frac{3-3}{3-3} = 34$.

Pelage.— ADULTS: Sexes similar. *Summer.* Greater part of animal dark brown, with grayish-white to pure white on neck from ears to shoulders. Area about under side of tail, belly and extremities of limbs whitish, the white about hoofs arranged as a band. Black patch on cheek and about eye. *Winter.* Head and neck whitish, rest of body grayish-ash to dull grayish-brown. Long hairs very coarse everywhere. Inner coat of fine hair present. YOUNG: General body color about as in adults, but with faint traces of white spotting.

Measurements.— Length, male, 6 to 6½ feet; height at shoulder, 42 to 48 inches; length of tail, 4 inches; antlers, 32 to 42 inches. Female, slightly smaller.

Range.— Labrador, region between Great Lakes and Hudson Bay extending from Maine to Montana and British Columbia, in forest lands.

Food.— Practically any green vegetation to be found in its range.

Remarks.— This animal is well marked off from other Caribou to the north by its greater size and larger horns, and from the Caribou to the west by its color and smaller size. There are many species of the Woodland group, but some are only slightly differentiated.

RELATED FORMS

Woodland Caribou.— *Rangifer caribou caribou* (Gmelin). Typical form. Canada from Maine to Rocky Mountains.

Richardson Caribou.— *Rangifer caribou sylvestris* (Richardson). Differing little from typical Woodland Caribou. Southern shores of Hudson Bay.

Mountain Caribou.— *Rangifer montanus.* Seton-Thompson. Size very large, color very dark, horns massive. British Columbia.

Osborn Caribou.— *Rangifer osborni* Allen. Very large in size, exceeding the Mountain Caribou. Antlers very long and heavy. Cassiar Mountains, British Columbia.

Peary Caribou.— *Rangifer pearyi* Allen. Pure white except for large dark patch on mid back. Known only from 4 skins. Ellesmere Land.

Stone Caribou.— *Rangifer stonei* Allen. Dark in coloration with heavy fringe of white hairs on front of neck. Antlers long and not especially massive. Kenai Peninsula.

Dawson Caribou.— *Rangifer dawsoni* Seton-Thompson. Size very small, color dark. Queen Charlotte Islands.

Alberta Caribou.— *Rangifer fortidens* Hollister. Largest of the North American Caribou. Coloration very dark. Antlers stout, heavily palmate. Females normally without antlers. Alberta.

Newfoundland Caribou.— See description which follows.

Barren-Ground Caribou.— See description which follows.

Scandinavian Reindeer.— See description which follows.

This Caribou, which is the original type of the Woodland Caribou group, is a large and powerful animal, about twice the size of a Virginia Deer. A typical specimen, from Maine, in the Zoological Park, New York, is described as "a strong lusty animal, forty-eight inches high at the shoulders, weighing 280 pounds, and endowed with sufficient energy to vanquish the strongest man in about one minute." The Woodland Caribou is an odd-looking creature. Its head, long and resembling somewhat that of the cow, is carried low and thrust forward; its shoulders are high and sharp. Its hoofs, which are deeply cleft, make, as it walks on the hard ground or withdraws them successively from the ooze of a marsh, a distinctly clicking sound.

When not suspecting danger, the Woodland Caribou has a careless, slouchy gait and, it must be confessed, an unattractive appearance; but when it scents a foe "the listless, careless pose gives place to one animated and full of spirited attention; the head is carried proudly aloft, crowned by its noble weapons of offense and defense. . . . And then, the foe appearing, how grand is the animal's movement as, in a stately trot, with head and tail uplifted, the proud Deer passes rapidly from view over the yielding moss."

The antlers present some noticeable differences from those of the Barren-Ground species, being generally "short in the main beam, liberally palmated both on brow-tines and tips, and have upwards of thirty points. As a whole, the antlers have a tree-top appearance."

One of the Woodland group, the so-called Osborn Caribou, is supposed to be the largest of Caribou; it has a height of fifty-five inches at the shoulders.

The summer coat of the Woodland Caribou is of a dark gray, with white under parts and a white caudal patch. In winter the body changes to a very light hue, and the neck becomes almost pure white. The color of the pelage varies considerably in different members of the group. The Black-faced, or Mountain, Caribou of southeastern British Columbia is, in September, nearly black, while the Barren-Ground is the whitest of all Caribou.

The female also may have antlers, though smaller. Antlers are shed between January 1 and the end of February, the new ones growing slowly till the warm weather comes, when they lengthen rapidly, attaining full size about September 1st. The animal removes the velvet, or soft covering, by rubbing its antlers against the trees, and is then ready to do battle. The pairing season begins in September, and usually one fawn is born each year. Occasionally two are produced.

The Woodland Caribou, unlike his Barren-Ground brother, is a wide-awake animal. In districts where his chief enemy, man, has not molested him he is confiding. His "first inclination on seeing an intruder is to come up and play with him." Mr. Charles Sheldon in the Upper Yukon district saw a Caribou with her young one which came twenty-five yards toward him, looked at him indifferently and then trotted off. When surprised, the animals seem to become panic-stricken and unable to escape; but as soon as they scent danger they are off. On the ice they are exceedingly swift, soon outdistancing the hunter. The Woodland Caribou is a forest rover, and is usually found in the swamps. The Cree Indians call it the Swamp Deer. They seek the mountains in the spring, and spend their summers above the timber line, hiding in dense thickets in the day and coming out at night to wander about and to drink of the nearest lake. In the autumn the Caribou leaves the heights for the valleys, where it can more easily obtain food. It feeds on lichens, leaves, and berries, and is especially fond of cranberries. The animal is hunted by stalking, still-hunting, and on snowshoes, and of late years its numbers in many districts have become greatly reduced.

No instance is known of the domestication of the Woodland Caribou, but the following incident is related of an attempt in this direction:

"The proprietor of a camp in the Maine woods had been much teased about the loss of useful labor he was incurring through not taming the Woodland Caribou. Shortly after, having trapped two fine animals, he proceeded to attach a rein, in the shape of a lasso, to one of the untamed creatures. Unfortunately, the Caribou reversed the order of things and taught the trainer a lesson. Slipping the lasso to his flanks, he made a bound of twenty feet, carrying his trainer like the tail of a kite, in a straight line after him. He dropped him, only to make a second leap, and a third finished the business."

The camp proprietor picked himself up, bruised from head to foot, and this was his first and last attempt at taming Woodland Caribou.

The flesh of this Caribou makes excellent venison and is much used by the northern Indians. In gait it resembles the Elk and Moose more than the smaller Deer. It travels with a long swinging trot, and goes much faster than it appears. The Caribou has good bottom and can travel great distances without a halt, so that it is almost useless to try and follow a band when once they have taken the alarm.

By permission of the New York Zoological Society

WOODLAND CARIBOU

This animal has recently shed its horns, and is not altogether happy about it

Like the Antelope, the Caribou sometimes exhibits curiosity. Mr. Ward, referring to this says: "The indifference or curiosity with regard to the noise of firearms exhibited by the Caribou often stands the hunter in good stead and affords him a chance for a second shot, should the first prove ineffectual; for it is not uncommon for a herd to stand stock-still on hearing the report of a gun, even when one of their number has fallen a victim thereto. The pause is but for an instant, and the hunter must be quick to take advantage of it, or his chance will be gone before he is aware of it, for, recovering quickly from the shock or alarm, or whatever it may be, the herd will dash off at a rattling pace."

NEWFOUNDLAND CARIBOU

Rangifer terrænovæ *Bangs*

General Description.— See general description of Woodland Caribou. Antlers massive with many points, general shape low, widely spread and points directed forward. Color lighter, more white on feet.

Dental Formula.— See dental formula given for Woodland Caribou.

Pelage.—ADULTS: *Autumn.* Body above grayish-brown, lighter on flanks and nearly pure white on ventral surface. Neck all around soiled-whitish, rather lighter in front; broad faintly defined eye-ring. Lower face, nose and terminal part of lower jaw grayish-white. Under surface of tail and buttocks white. Feet white. Front and outer surface of limbs brownish-gray.

Measurements.— About the same as Woodland Caribou

Range.— Newfoundland.

Food.— Leaves, twigs and moss.

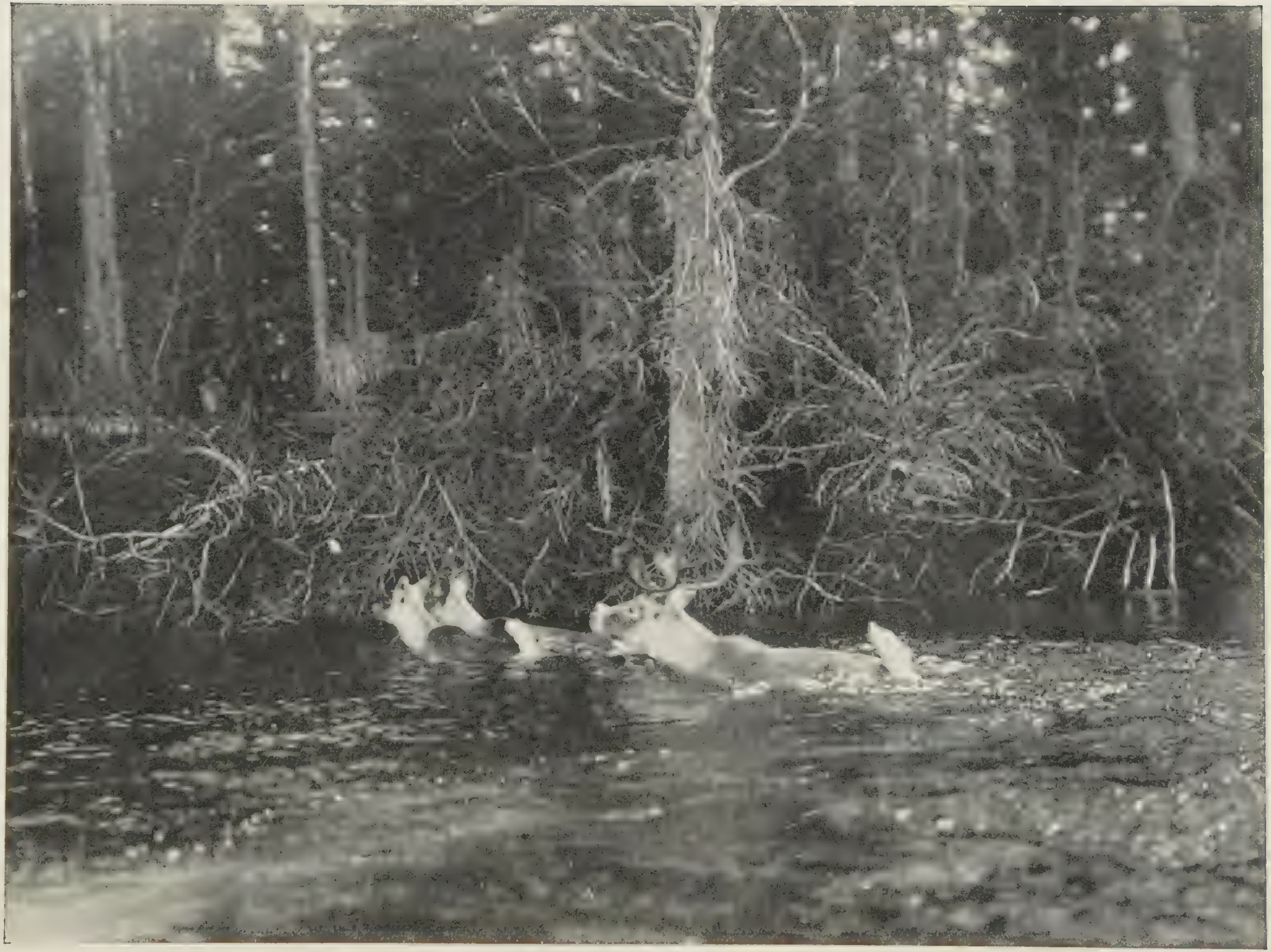
Remarks.— A heavy-antlered relative of the Woodland Caribou.

Newfoundland is one home of the Caribou where, thanks to the excellent game laws in force, it will be able to exist secure from the probability of extinction for many years to come. Mr. J. G. Millais, writing in 1907 ("Newfoundland and its Untrodden Ways"), considered 200,000 to be a fair estimate of the number of animals of this species then on the island. Every native is allowed to kill three Caribou, but the total annual slaughter is estimated at not more than 6 per cent. Naturalists are indebted to one sportsman, Mr. A. A. Radclyffe Dugmore, for an intimate account of the life of this Caribou. It should be explained that he hunted with a camera, and the results of his campaigns are given in his "The Romance of the Newfoundland Caribou."

A good stag of the Newfoundland species stands four feet high at the shoulder, and its length varies from six feet to nearly seven feet. Its weight would be between 300 and 500 pounds. The does are less, both in size and weight. The color of the pelage varies so much, both with the seasons and in individual animals, that only an approximate description can be given. In summer, it is generally a rather dark mouse-gray, shading to almost white on the flanks. There is a white ring round the eyes, and the ears are very light gray. In autumn, the white neck is conspicuous on the stags, less noticeable in the does. The flanks and underparts are white or very light buff-gray, shading upward to the shoulders, back, and the upper part of the hips, which are all of a warm gray or brown. The tail is about seven inches long and conspicuously white. The nose is white or nearly so; the throat and below the ears nearly always white, as is also the throat mane. This mane varies in length from two to twelve inches. The legs are sometimes light and sometimes dark. The winter coloring is very light gray or white.

Of the antlers Mr. Dugmore says: "In a general way the Newfoundland stag carries a more massive antler than that carried by even its closest cousins." Quite a number of the does are hornless, as many as twenty-four without horns having been counted in a herd of 300.

The mating season is in October, the first three weeks. The stag "believes in a plurality of wives — a great plurality; in fact, as many as he can keep under control." Sometimes the stags leave all their does and take possession of an entirely new herd. Fighting for the possession of the does is not at all uncommon, and Mr. Dugmore photographed two stags in the thick of such a conflict. Unless a heavy snowfall occurs, the Caribou remain near their summer quarters up in the higher lands until the rutting-time is over. With the first heavy fall after the middle of October the migration southward to the winter home begins. The animals move in groups of two and three to herds of 100 or more. Each herd is usually led by a doe. Sometimes the pairing season and the migration occur together. At this time the stag presents "a striking contrast to the shy, retiring creature of the preceding months; and yet even greater contrast to the woebegone, miserable beast of the succeeding weeks. . . . It is indeed difficult to believe that this is the same animal, so great is the change. And yet the sportsmen who hunt the Caribou usually see them at no other time. How can we wonder at the wretched drawings so frequently seen supposed to represent the mighty stag?" On the migrations each herd has its sentry. Their speed "is not less than five or six miles an hour when they walk, which is their usual gait; only under rather exceptional circumstances do they trot for any distance, while they seldom resort to galloping unless they are frightened. On warm



WOODLAND CARIBOU
A stag and two fawns making for dry land

days they take things easy, traveling in the most leisurely fashion, and spending the greater part of the day in resting and feeding, particularly between the hours of nine and three." Their favorite food is the reindeer moss. When winter comes, and the snow is too deep for them to dig out their ground moss and lichens, they turn to the tree-growing mosses, such as the Usnea, or Old Man's Beard. When "the winter begins to break, the days become longer, the nights less bitter, and the Aurora Borealis is no longer seen, the Caribou becomes restless; the large herds break up, and in ones and twos the does begin the long return journey to their summer homes in the north."

The young Caribou are born in June; generally there is but one fawn, occasionally twins are produced; the nursery being in the thick forests of spruce. The Caribou has few enemies in Newfoundland. "Wolves are practically extinct on the island; the Lynx is rare, but its extreme cunning makes it a danger to be dreaded. . . The chief enemies are . . . mosquitoes and several species of flies, some of which cause intense annoyance and suffering." The does nurse their young as late as November. The summer months are spent in the higher regions, where, "often hidden away among the forests, marshy barrens abound, and nearly all are sprinkled with small ponds and lakes."

BARREN-GROUND CARIBOU

Rangifer arcticus (*Richardson*)

General Description.— See general description of Woodland Caribou. Much the same as the Woodland Caribou, but smaller in size with very long, slender horns. Much whiter feet and legs.

Dental Formula.— See dental formula of Woodland Caribou.

Pelage.— ADULTS: *Summer.* Above, clove-brown mixed with dark reddish and yellowish-browns, underparts and lower side of neck white. *Winter.* Entire coat soiled white.

Measurements.— A little smaller than the Woodland Caribou.

Range.— North of the forest zone in Arctic America in the barren districts.

Food.— Largely moss and twigs of small shrubs.

Remarks.— One of the smallest of the Caribou and living the farthest north. Differing from the other Caribou in the characters given above, it is commonly classified in a distinct group. It has several relatives in this group in North America, besides the European, or Scandinavian Reindeer.

RELATED SPECIES

Barren-Ground Caribou.— *Rangifer arcticus* (Richardson). Typical form. Barren-Ground region of Arctic America.

Grant's Caribou.—*Rangifer granti* Allen. Size small. A white rump patch. Brow tine much expanded. Barren grounds of Alaska Peninsula.

Greenland Caribou.— *Rangifer groenlandicus* (Gmelin). Size small. Antlers long, slender, with but few points. White ring around eye. Greenland.

This denizen of the treeless, desolate wastes extending from Hudson Bay to Great Slave Lake, and known as the Barren Grounds, is a smaller animal than the Woodland Caribou, and the only deer of this region: hence its name. The front of its head is more cowlike than that of the Woodland species, and its antlers are disproportionately long. They have fewer points than those of the Woodland, and the brow tines incline downward. As a whole they present an armchair appearance. Both the males and the females have horns and shed them annually.

The Barren-Ground Caribou winters in the woods in latitude about 63 to 66 degrees, the bulls going deep into the forests, and the females remaining near their edges. About the end of April they make short excursions from the woods, returning, however, if the weather is frosty. In May the females make their way to the sea-coast, and in the following month are joined by the bulls. In the section immediately east of the Mackenzie River the females leave the timber about March, and the bulls follow in April. The spring journey is made partly on the snow, and, after the snow has disappeared, on the ice that covers the lakes and the rivers. Soon after their arrival at the coast of the Arctic Sea the females drop their young, usually two, although some of the Indians say they have seen females with three fawns. The herds feed on the moist pastures of the valley bottoms of the coasts and islands until September, when they begin their return journey to the south. The woods are reached in October, the bulls seeking their winter quarters in the deep recesses, and the females remaining on the edges. The bulls do not go so far north as the females, and meet the latter on their return from the coast.

It is difficult to realize the vastness of these migratory herds. Mr. Warburton Pike saw, in 1899, a band of migrating Barren-Ground Caribou that took six days to pass a certain point. He says: "With the increasing depth of the snow there was a noticeable migration of life from the Barren Grounds. Ptarmigan came literally in thousands, while the tracks of Wolves, Wolverines and Arctic Foxes made a continuous network in the snow. Scattered bands of Caribou were almost always in sight from the top of the ridge behind the camp, and increased in numbers till the morning of October 20th, when we were awakened before daylight by the cry of 'La Foule, La Foule!' and even in the lodge we could hear the curious clatter made by a band of traveling Caribou. La Foule had really come and during its passage of six days I was able to realize that an extraordinary number of these animals still roam in the Barren Grounds. From the ridge we had a splendid view of the migration; all the south side of MacKay Lake was alive with moving beasts, while the ice seemed to be dotted all over with black islands, and still away on the north shore, with the aid of the glasses, we could see them coming like regiments on the march. In every direction we could hear the grunting noise that the Caribou always make when traveling; the snow was broken into broad roads, and I found it useless to try to estimate the number that passed within a few miles of our encampment. This passage of the Caribou is the most remarkable thing that I have ever seen in the course of many expeditions among the big game of America. The Buffalo were for the most part killed out before my time, but I cannot believe that herds on the prairies ever surpassed in size La Foule of the Caribou."

At such times the Caribou is an easy prey for the hunter. The Indian's method is very simple. In open country or on the frozen lakes, he will start straight for a band of Caribou, regardless of the direction of the wind. If they run away, he will go back and report that they are wild. Next day he does the same, and probably they are more playful and the slaughter is numerous. Dr. W. T. Hornaday relates that "along the Arctic coast, between Point Barrow and the mouth of the Mackenzie, tens of thousands have been killed by the natives and sold to whaling ships wintering along that coast." In the water the animal is speared by the natives in canoes.

The importance of the Barren-Ground Caribou to the natives can hardly be overestimated. It may safely be said that the animal supplies the staple food and clothing material for three-fourths of Canada's great area. The Indians and Eskimo make tents of hides sewn together; fish-hooks are made from the horns; the skin with the hair on makes the finest clothing to resist the Arctic cold; the flesh is eaten; and the fat, sometimes two or three inches in depth, on the back and rump, which the French-Canadian hunters call *depouillé,* is a valuable article of trade.

By those who have had the most favorable and frequent opportunities of observing it, the Barren-Ground Caribou is regarded as a somewhat stupid animal. It is very inquisitive, and will approach closely any new or strange object, if the latter is only motionless. The Eskimo takes advantage of this weakness. Placing himself behind a rock, he will imitate their hoarse bellow, and in a short time some of them are certain to draw nearer and nearer to the decoy until they pay for their curiosity with their lives.

The animal suffers sometimes from a disease of the hoofs, but this is not often very widespread. Its chief tormentor is the gadfly, the larvae of which sometimes perforate its skin.

Mr. David T. Hanbury says that the migrating Caribou in the Northwest "arrive in bands of from about a dozen to as many as two hundred. Trotting quickly down to the edge of a river they take the water without a moment's hesitation. They swim with marvelous speed, almost appear to be trotting and they keep up a peculiar grunting noise while in the water. The Huskies (Eskimo) wait till they are fairly in mid-stream, then shoot out in their kyaks and surround the band. The spearing then commences. The slaughter is sometimes great.

"The deer show no signs of diminution at present, nor will they so long as the population of the North remains as it is. They exist in hundreds of thousands, it is safe to say millions; and, the few hundreds, perhaps thousands, killed by the Huskies are insignificant."

REINDEER

Rangifer tarandus (*Linnaeus*)

General Description.— See general description of Woodland Caribou. Size smaller than Woodland Caribou, with antlers longer, less palmate and massive. Pasterns short and broad. White ring above hoofs poorly defined.

Dental Formula.— See dental formula of Woodland Caribou.

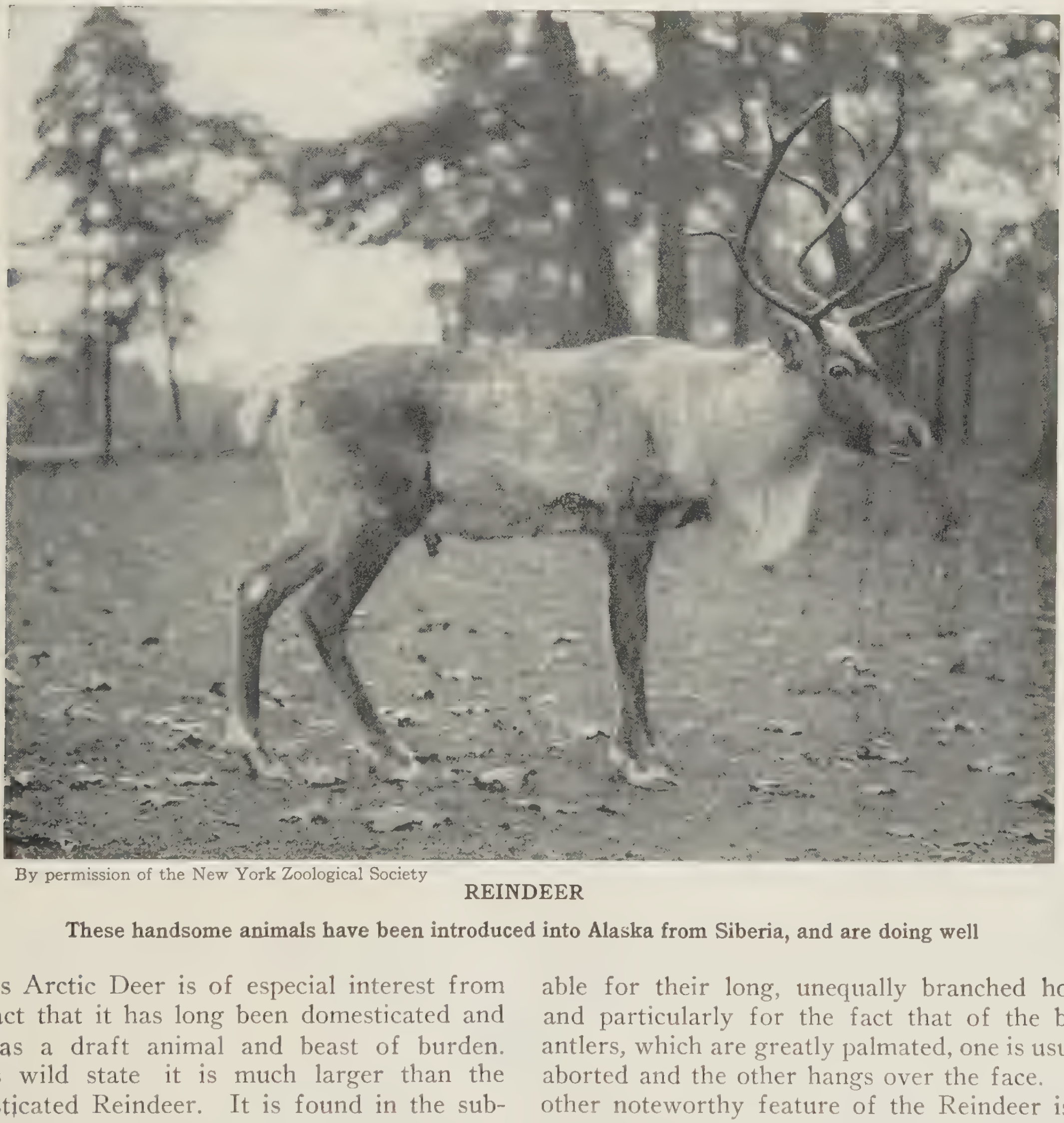
Pelage.—General body color clove-brown, limbs sooty, sides of neck and long hair on throat whitish, blackish along sides of belly. Nose and face dark. Narrow white band about feet above hoofs in male; in female this band may be wanting.

Measurements.— A little smaller than the Woodland Caribou.

Range.— In North America has been introduced into Alaska and Labrador.

Food.— Same as other Caribou.

Remarks.— By some authorities the Scandinavian Reindeer has been considered nearest to the Woodland Caribou, but the character of the antlers seems to place it with the Barren-Ground species.



By permission of the New York Zoological Society

REINDEER

These handsome animals have been introduced into Alaska from Siberia, and are doing well

This Arctic Deer is of especial interest from the fact that it has long been domesticated and used as a draft animal and beast of burden. In its wild state it is much larger than the domesticated Reindeer. It is found in the sub-Arctic and Arctic regions of Europe and Asia, nearly as far north as the extreme limits of land.

A distinguishing feature of the Reindeer is that both sexes have antlers. These are remarkable for their long, unequally branched horns, and particularly for the fact that of the brow antlers, which are greatly palmated, one is usually aborted and the other hangs over the face. Another noteworthy feature of the Reindeer is its hoof. Just as the camel is enabled by its broad pad to traverse the trackless sands of the desert, so the Reindeer is equipped by nature for traveling over the vast snowfields of the North.

The Reindeer has a brownish coat, dark in summer and lighter in winter, with long, whitish hairs under the neck; the tail is short and goat-like, and the region about it, as also the outlines of the hoof, are nearly white. The hoofs themselves are black.

Of the breeding habits of the wild Reindeer little is known beyond the fact that the fawns are brought forth in the spring.

The Reindeer in its wild state wanders about the treeless mountains and desolate tundras, migrating in immense herds from one feeding-ground to another. Admiral von Wrangel, who witnessed one of these migrations, describes it as extending " further than the eye could reach, a compact mass narrowing to the front. They moved slowly and majestically along, their broad antlers resembling a moving wood of leafless trees. Each body was led by a Deer, a female, of unusual size."

The Reindeer feeds largely on grasses, seaweed and rock lichens. To obtain the last of these it will scrape away several feet of snow with its horns and feet.

Besides flesh and milk for food, the Reindeer furnishes skins for clothing and tents, and its horns and hoofs are also utilized commercially.

The remarkable strength, speed, and endurance of the Reindeer in drawing sledges over the snow are so well known that they need only be referred to here. Pictures of Santa Claus with his Reindeer sledge full of Christmas presents are among the recollections of our earliest childhood.

The interest of Americans in the Reindeer, however, centers in the experiment, made about a quarter of century ago by the United States Government, of introducing Siberian and Lapland Reindeer into Alaska. This experiment has been so remarkably successful as to warrant more than casual mention here.

About the year 1887 the native tribes of northwestern Alaska, owing to their uneconomical habits of living and the loss of food supplies, were in great danger of starvation. The suggestion was made to the United States Government that it would be a useful and humane undertaking for the Government to introduce Reindeer into the territory, and to train the natives in the care and use of them. In 1892, one hundred and seventy-two animals were imported. By 1902 there had been introduced, from Lapland and Siberia, 1720 Reindeer, from which 6116 fawns had been born. On June 30, 1913, the herds had increased to sixty-two, numbering no fewer than 47,266 animals, an increase of 20 per cent. over the previous year. During the year 5000 had been killed for food and skins.

The distribution of the Reindeer to the natives of Alaska is made pro rata. Young natives are required to serve an apprenticeship of four years in the care and management of Reindeer, animals and food being supplied by the Government to such apprentices.

It is estimated that there are in Alaska areas of 400,000 square miles in the aggregate sufficient to feed 10,000,000 Reindeer.

Lapland Reindeer have recently been introduced into Labrador and northern Newfoundland, and the experiment promises great success.

THE ANTELOPE FAMILY

(*Antilocapridæ*)

ANTELOPES, while a family which has many important members in Africa are represented in North America by only one member, the Pronghorn. This unique animal is more nearly akin to the *Bovidae*, or oxen and sheep, than to its foreign brothers. It differs so widely from the foreign Antelope that scientists in despair have created for it a separate family which it occupies alone and undisturbed. The more important points of difference are: the horn is pronged, or branched, and is rooted very close to and above the eye; the horn, while a true one grown around a bony core, and not an antler, is shed and renewed every year; the pelage consists of very coarse, brittle hairs, those on the rump being erectile like the bristles of a wild boar, and stiffen up at the first sign of danger; there are no accessory hoofs; and the marking is strikingly individual. The protective coloration, while generally good, is disturbed by the conspicuous white patch around the tail, which shows most plainly when the animal is in flight.

PRONGHORNED ANTELOPE

Antilocapra americana (*Ord*)

Other Names.— Pronghorn, Prongbuck, Antelope.

General Description.—Form deer-like, The male slightly larger than female, standing about 3 feet at shoulder. Both sexes horned, but female sometimes hornless, and horns of male invariably larger. Horns unique, being flattened, branched, elongate sheaths upon an unbranched bony core. Horns shed annually; core permanent and situated just above orbit. But two hoofs on each foot, accessory hoofs wanting. Body color tan, with conspicuous white rump patch and two white bands across throat and chest. A thick mane of long hair on neck. Hair everywhere coarse and brittle. Ears long and pointed. Tail short, densely haired above. Numerous cutaneous scent glands on jaw, rump and legs. Horns and hoofs black.

Dental Formula.—Incisors, $\frac{0-0}{3-3}$; Canines, $\frac{0-0}{1-1}$; Premolars, $\frac{3-3}{3-3}$; Molars, $\frac{3-3}{3-3}=32$.

Pelage.— ADULTS: Sexes similar. Upper parts and sides rich tan. Entire under parts white. A large area on rump, inside of limbs, sides of face, lips and chin, white. Two white crescentic bands on throat, and white areas on inner surfaces and bases of ears. Mane russet tipped with black. Ears lightly edged and tipped with black. A black spot in male only, on side of head at angle of jaw, and a black area from end of nose to between ears. Tail white. Summer pelage differs from winter pelage principally in having more black markings, mainly on head. YOUNG: Paler than adults.

Measurements.— Length, male, 4 feet; tail 7 inches; height at shoulder 3 feet; horns about 11 or 12 inches in length. Weight, 120 pounds. Female smaller.

Range.— Formerly throughout plains country from 53° latitude south to Mexico, from the valley of the Missouri to the Pacific. Now, range is restricted principally to strip extending along Rocky Mountain area.

Food.— Grass, sage and herbaceous plants.

Remarks.— The Pronghorn is the sole representative of a family that combines characters of a number of widely separate families. It presents peculiarities of the Giraffes, the Goats, the African Antelopes and the Deer. It has no close relative on any other continent. But two forms of the Pronghorn are found in the United States.

RELATED SPECIES

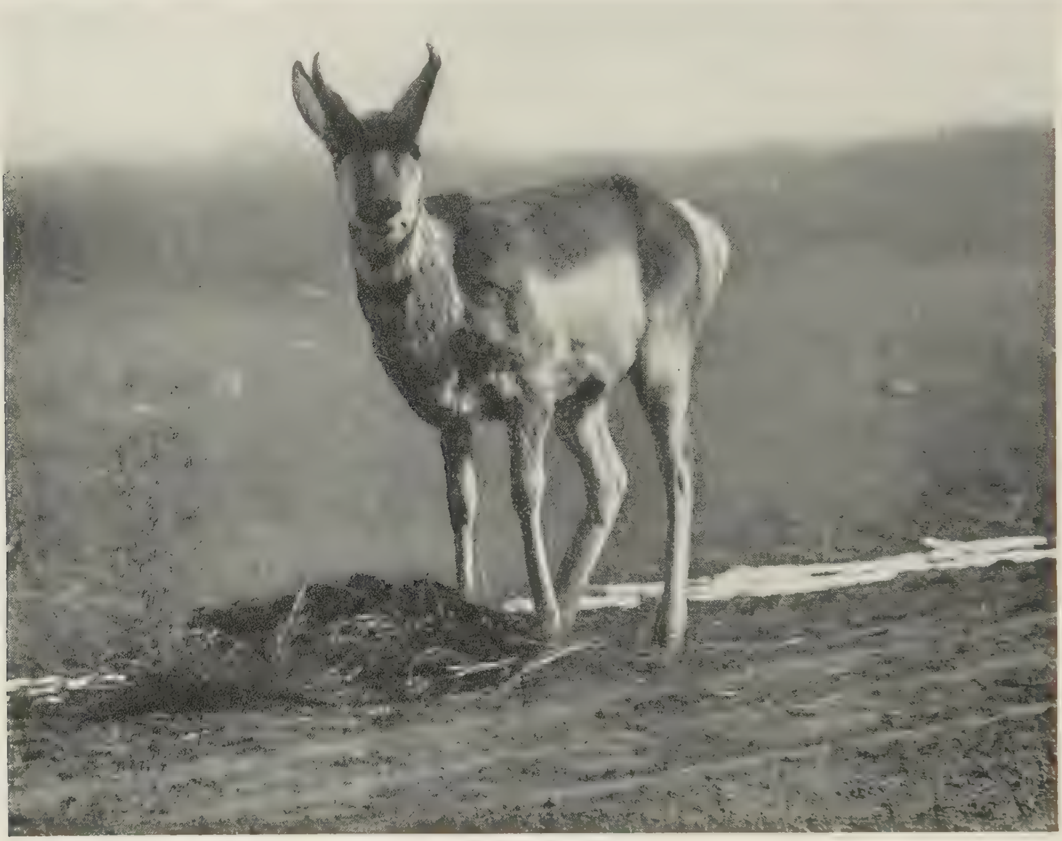
American Pronghorn.— *Antilocapra americana americana* (Ord.) Typical form. Greater part of the Rocky Mountain and Great Plains area from Mexico to 53° latitude.

Mexican Pronghorn.— *Antilocapra americana mexicana* Merriam. With black of head replaced by brown. Southern United States along Mexican border.

The American Pronghorn, known also as the "Prongbuck," "Pronghorned Antelope," or, simply, "Antelope," has the distinction of being the sole representative of a family, this unique position being due to certain characteristics among which are the following: It is the only animal that has a hollow horn that is branched or bifurcated. While the hollow horns of other animals are persistent, those of the Pronghorn are shed and renewed annually. Hunters had long known this, but for many years the naturalists, including Audubon himself, would not accept the fact. Its feet have no lateral hoofs, or dewhoofs. It has no gland below the eye, nor any tufts of hair on the knees. It can erect the white hairs on its rump, and when the animal is in fighting mood, they instantly bristle up.

The Pronghorn is strictly a North American animal, and is the most graceful and the fleetest of all our quadrupeds. Until within the past few years it has been extensively slaughtered, and, but for the timely legal protection afforded it by all the States within whose boundaries it is still found, it must in the course of a comparatively short period have suffered complete extermination. The Pronghorn first became known to scientists through a specimen brought back by Lewis and Clark from their expedition. Its range originally extended from the Mississippi River to the Pacific Ocean, northward into Canada, and southward into Mexico. At the present day only a few small, widely scattered herds exist, in California, Oregon, Utah, Idaho, Nevada, New Mexico, Texas, Kansas, Colorado, Wyoming and Montana; from the extreme easterly and westerly limits of its former range it has disappeared entirely.

In its wild state, the Pronghorn normally prefers a barren rolling country or naked plains, and avoids timber and broken ground; it has, however, been killed occasionally in places miles away from the nearest plains, and in recent years has been known to bring up its young in rough, hilly country. It avoids forests, and has no liking for high, bare mountains.



Photograph by E. R. Warren

PRONGHORNED ANTELOPE

A graceful, fleet-footed animal that has no relatives in America, but occupies a family by itself

The Pronghorn is smaller than the northern Virginia Deer, but is more compactly built. The animal has a fuller muzzle than the Deer; its eye, nearly as large as that of the Elephant, is intensely black; and the expression, like that of the Gazelle, is soft and gentle. The ears, five inches long and three inches broad, and sharply pointed at the extremities, are covered with hair, both within and without. The earlier statement, that the female has no horns, is at variance with the observation of the animal by Dr. Caton, who says: "The horn of the female cannot be detected on the kid, on the yearling it can easily be felt; later I have found them half an inch long . . . and it is only on the fully adult female that the horn appears above the hair. I have never met one more than one inch long, but others have found them three inches long." In an average-sized buck the horns are usually about twelve inches long (an exceptionally large pair measured seventeen inches), with width of twelve and one-half inches between the tips, and are situated directly over the eyes. At the tips they are curved backward a little, and they have a short forward branch or prong.

The coloration of the Pronghorn renders it a very conspicuous object in the landscape. It is a striking combination of russet, white and black (see details above). The tail is white with just a few tawny hairs on the top.

In several of its characteristics the Pronghorn differs materially from the Deer. It does not skulk or attempt to elude observation. Colonel Roosevelt, who hunted the animal for several years, says: "Its sole aim is to be able to see its enemies, and it cares nothing whatever about its enemies seeing it." When lying down for their noonday siesta, Pronghorns will even "choose a somewhat conspicuous station and trust to their own powers of observation, exactly as they do when feeding." Its powers of sight are much greater than those of the Deer, and it seems to divine intuitively the intentions of the hunter. On this point Mr. Arthur W. du Bray says he entirely agrees with the following dictum of one of his old guides: "What a live Antelope don't see between dawn and dark isn't visible from his standpoint; and while you're a gawking at him thro' that 'ere glass to make out whether he's a rock or a goat, he's a countin' your cartridges and fixin's, and makin' up his mind which way he'll scoot when you disappear in the draw to sneak on 'im — and don't you forget it."

ANTELOPES AT HOME

The most picturesque and the fleetest of all our North American quadrupeds

In a wild state, the curiosity of Pronghorns is so great that it often leads them to their destruction. In the old days of the prairie-schooner, the animals, attracted by the white canvas covering of that vehicle, would come so near that the teamsters shot them at will. James Capen Adams used to decoy them by merely holding up a handkerchief, his coat, or his hat; and he records that "to lie on one's back, with the feet in the air and the rifle between the legs, is a favorite and very successful mode of hunting them."

The Pronghorn is a grazing animal, a vegetarian, and a delicate feeder. When wild, it lives largely on grasses, and is especially fond of the tender green blades that come up after an area has been burned over. It drinks once a day, and will travel long distances to some little watercourse. In captivity, it will eat apples sparingly, bread and cake if fresh and good, and the heads of timothy hay. It is fond of common salt.

The migratory habits of the Pronghorn vary with the locality. In some parts of its range it will travel in numbers for great distances each spring and fall; in others the migrations are quite local; while in still other parts it does not migrate at all, remaining on the great plains throughout the year.

Pairing begins in September, and from then till the following March bucks, does, and fawns keep together in herds from which the does withdraw themselves one by one to give birth to their young. There are generally two fawns at a birth, and, when wild, they can run when only a few days old, thenceforward accompanying their mother everywhere.

Chasing the Pronghorn has long been a favorite sport. Besides its inordinate curiosity, to which reference has already been made, the animal has a peculiarity of which hunters are not slow to take advantage: when it has decided to make for a certain point, it is strongly disinclined to abandon its course. It is hunted by stalking and by coursing with greyhounds. The Pronghorn has wonderful vitality, and is credited with being able, when wounded, to carry off more lead than any other animal of its size. If hit anywhere except in a vital spot, "it can still outrun any ordinary horse — even on three legs." Its flesh is excellent, but its coat is of little value, the hair being very brittle.

Besides the inevitable hunter, the Pronghorn finds enemies in the Coyote, the Wolf, and the Cougar, and eagles have been known to carry off fawns. It seems tolerably certain, too, that, owing to the exposed nature of many of the Pronghorn's haunts, blizzards, and unduly severe winters must claim a great many victims.

The Pronghorn is readily tamed and soon learns to enjoy the society of man. A neighbor of Colonel Roosevelt had three fawns that had been fostered by a sheep, and which followed him about so closely that he had to be always on the lookout to see that he did not injure them; and Dr. Caton had one which "assumed he had as much right in the kitchen as any of the domestics, and, if he found the doors open, he enjoyed a visit to the parlor, and especially a siesta on the lounge in the library."

Mr. Merritt Cary, in "A Biological Survey of Colorado," says that this most graceful game animal seems doomed to early extinction in many sections despite the protection afforded by the law. The decrease of Antelope in Colorado during the past few years has been great. In 1898 the State game warden placed the number at 25,000, while in 1908 the game commissioner estimated not over 2000. A conservative estimate based on data collected by the Biological Survey would be not over 1200 in this State.

THE OXEN, SHEEP, AND GOAT FAMILY

(*Bovidæ*)

ONE of the most important families of the entire animal kingdon is the *Bovidæ.* Its economic value to man, in both its wild and domesticated states, is incalculable. There are some fifty leading species, such as Bison, Buffalo, Mountain Sheep, Goats, Musk-ox and Ibex, found in every continent except Australia and South America. In our own country we have some of the finest specimens of the family, although the numbers have sadly dwindled before the relentless war of extermination which has been waged. The Bison, or Buffalo, is a striking example of this. A few decades ago it roamed the western plains in countless thousands. By the end of the century only heroic efforts on the part of the Government and the establishment of a few private parks saved it from perishing entirely.

The Hollow-horned Ruminants, or *Bovidae,* are distinguished from their allies by the presence of true horns; that is to say, of hollow and unbranched sheaths of horn growing upon bony protuberances, or cores, arising from the frontal bones of the skull, neither horny sheaths nor the bony cores being shed at any period of existence. In all existing wild species these horns are present at least in the male sex; but in many domesticated races of cattle, sheep, and goats, they are absent in both sexes; and the same holds good for certain extinct members of the family. Usually the molar teeth of the Hollow-horned Ruminants are characterised by the great relative height of their crowns, and in all cases there is no tusk or canine tooth in the upper jaw. In some few instances the small lateral toes may be completely absent, but they are generally represented merely by the small spurious hooflets alone, which may be supported internally by minute and irregularly-shaped nodules of bone. The Hollow-horned Ruminants are chiefly Old World forms, although they are represented in North America by the Musk-ox, the American Bison, the Rocky Mountain Goat, and the Bighorn Sheep. They are unknown in South America.

AMERICAN BISON, OR BUFFALO

Bison bison (*Linnaeus*)

General Description.— A large wild ox, horned in both sexes. The horns are curved and cylindrical, and grow annually but are never shed. Two main hoofs, two accessory hoofs, on each foot. Stomach complex; chews cud. Spines of dorsal vertebrae very high producing great hump. Tail short, covered with short hair, but tuft of long hair on end. Hair long and woolly especially on head and fore parts. Thick beard present. Color dark brown. Horns, hoofs and muzzle black.

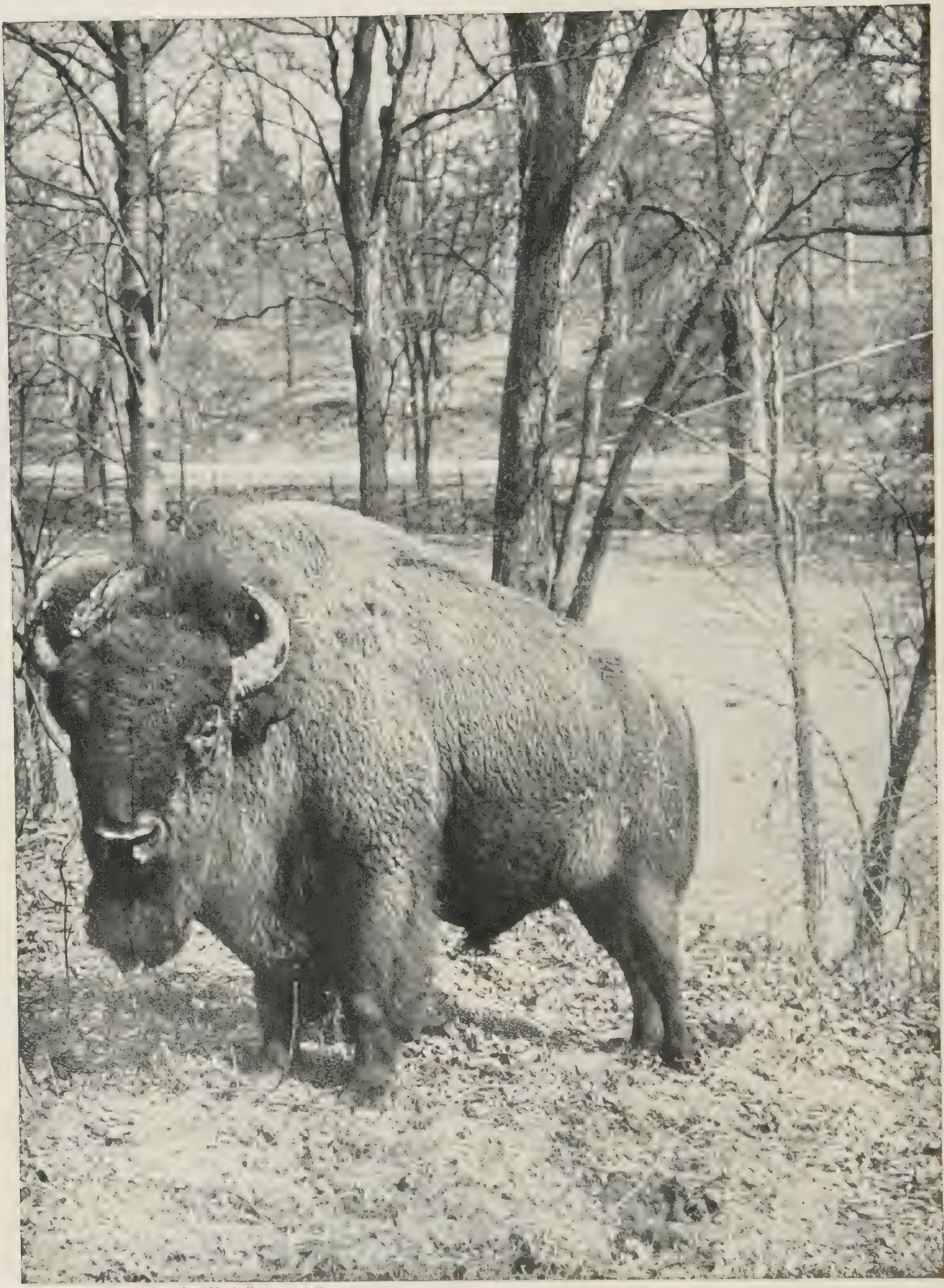
Dental Formula.—Incisors, $\frac{0-0}{4-4}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{3-3}{3-3}$; Molars, $\frac{3-3}{3-3}=32$.

Pelage.— Adults: Sexes much the same, with cow a trifle darker in body color. Head, neck, chest, and shoulders blackish-brown to black. Elsewhere pale, grading to cinnamon on rump. Hair long and shaggy; an undercoat of finer wool-like hair. A long beard upon the chin, and thick tufts of longer hair upon crown, about base of horns and down forelimbs about to accessory hoofs. Hair much shorter on area beginning just back of fore limbs and taking in hind quarters. Young: At birth, dull reddish-yellow, paler on under parts. At six months, assumes more the adult appearance; by end of second year, everywhere deep glossy blackish-brown. Pales with age.

Measurements.— Length, male, 10 to 11 feet; height at shoulder, 5 to 6 feet; length of tail, 15 inches. Horns 20 inches long by 15 inches girth at base. Weight 1800 to 2100 pounds. Female, height at shoulder 4½ to 5 feet; weight 700 to 1200 pounds.

Range.— Historic range from Great Lakes to the Rockies, and from Northern Mexico to 60° latitude. By 1870 restricted to a strip north and south along Great Plains and eastern Rockies; by 1880 found only in area formed by North Dakota, Montana and Wyoming with a few in Texas and in Canada. Now extinct in the wild state, and known only from zoological herds and animals on reservations.

Food.— Grasses of the plains.



By permission of the New York Zoological Society

MONARCH OF THE HERD

A fine specimen of the Bull Bison, or Buffalo, showing his shaggy winter coat

Remarks.—The Bison is the only wild ox, with the exception of the Musk-Ox, found in North America. There is no animal with which it may be confused although the term Buffalo, through its common use for oxen of the Old World, is not a happy name for the Bison. There is but one species of Bison, which contains two sub-species.

RELATED FORMS

American Bison.—*Bison bison bison* (Linnaeus). The typical form.

Woodland Bison.—*Bison bison athabascae* Rhoads. Larger and darker than the typical Bison with longer, more slender horns. Found formerly in the wooded uplands from Great Slave Lake south probably to the United States. Known now only from a few survivors along the Great Slave River.

Because of its northern distribution this animal did not come so much into contact with white men and civilization, but rather with Hudson Bay trappers and Indians. Its habits and characteristics were much the same as those of its southern relative.

The American Bison has long been popularly, through erroneously, known as the Buffalo, and the two terms will be used synonymously here. For the benefit of the non-naturalist it may be explained that a true Buffalo has no hump over its shoulders. Such an animal is the Water Buffalo of India, or the Carabao of the Philippine Islands. The American Buffalo has a considerable hump, and is a Bison. It is a large, massive animal, a fine adult bull measuring eleven feet from nose to root of tail, and five to six feet in height at the shoulders. Its average weight is about 1800 pounds, but a large specimen has weighed as much as 2190 pounds; the females are considerably smaller than the males. Its horns are sometimes twenty-two inches in length, with a girth of sixteen and three-eighths inches at the base, and a spread of thirty-five inches from tip to tip. In yearlings, the horns are four to six inches long. Until four years old, the young males are called "spike-bulls," and their horns are jet black. In the adult, they become grayish. The forequarters are very heavy and covered with dense hair, and the tail has a terminal tassel.

The upper part of the body and the hind quarters are of a pale gray-brown; the lower parts, dark brown. The hump is covered with a dense mass of yellow-brown hair; the head, under part of the neck, and the forelegs as far as the knees bear a covering of shaggy hair shading from dark brown above into black below. The body color of the cow is darker. The coat of the Bison is at its best in November and December. By March it has become weather-beaten and shabby, and shedding begins. For the next three months the old coat hangs in rags, and the animal presents a most dilapidated appearance.

Naturally among the millions of individual Buffaloes a few years ago, the hide, or "robe," as it was termed, exhibited many color varieties. Thus there were black, blue, beaver, buckskin, and white or pied robes. The last-mentioned were considered the rarest. The great Cheyenne chief Roman Nose had a magnificent pure white robe, which he called his "great medicine," and which he was wearing when he fell before Forsyth's troops.

It seems pretty well established that the Bison is polygamous, the observations of Audubon and Bachman to the contrary notwithstanding. The breeding season is from June to September. The cow does not breed till her third year. The combined bellowing, or "roaring" as it is called, of the bulls in the breeding time can be heard for miles. The calves (usually one, sometimes twins) are born about May or June. In their wild state, during the few first days of their life they were formerly subject to the depredations of the Coyote and Gray, or Buffalo Wolf. Against one or two of these the cow could successfully defend her offspring, but if the assailants were numerous she would bellow to the bulls for assistance. These would quickly respond and would stand in a circle around the calf, while the wolves "at some twelve or fifteen paces distant sat licking their chops in impatient expectancy." An incident of this nature was witnessed by an army surgeon, as related in "Plains of the Great West." The doctor determined to watch the performance. After a few moments the knot broke up, and, still keeping in a compact mass, started on a trot for the main herd, some half a mile off. To his very great astonishment, the doctor now saw that the central and controlling figure of this mass was a poor little calf, so newly born as scarcely to be able to walk. After going fifty to one hundred paces the calf lay down, the bulls disposed themselves in a circle as before, and the wolves who had trotted along on each side of their retreating supper, sat down and licked their chops again; and so, though the doctor did not see the finale, it being late and the camp distant, he had no doubt that the noble fathers did their whole duty by their offspring, and carried it safely to the herd. In less than a week from their birth the calves are strong enough to run with the herd, and their safety is then assured.

The cow Bison is not always the most solicitous of mothers as regards her little one's safety. Mr. Ernest Thompson Seton states that a cowpuncher some years ago "often amused himself by roping the calves. When one was caught, he would jump off, remove the lasso, and hold it with his hands. The mother would stand at a distance of 100 yards gazing anxiously, neither cow nor calf making any sound. As soon as he let the calf go, the mother, seeing it was free, knew it would take care of itself, and, turning tail, went off at full gallop, without even looking behind."

As the Bison shed their coats, leaving much of their hinder parts naked, they suffered much from the attacks of mosquitoes and from the prickly seeds of the spear grass. The huge animals availed themselves of any convenient boulder or the trunks of trees against which to rub themselves, in their desire to gain relief from their insect scourges. The early telegraph poles over the plains were frequently thrown down by the Buffaloes rubbing against them. Another remedy employed was the wallow of water and mud.

GETTING READY FOR SUMMER

The Bison shed their shaggy coats with the approach of spring, and do not don them again until well into the fall

During the latter part of the breeding season the animals of all ages and both sexes have intermixed in the herd. After September the males become indifferent to their partners, and separate themselves into one herd and the females into another. As early as 1542, Coronado and his followers were "much surprised at sometimes meeting innumerable herds of bulls without a single cow, and other herds of cows without bulls."

There has been some difference of opinion with regard to the Buffalo and migration. Catlin says: "These animals are, truly speaking, gregarious but not migratory;" and there are to be considered the undoubted facts that the line of march was not always the same, that in certain cases the movements of the herds were not prompted by the necessity of seeking fresh pasturage, and that herds were found winter and summer over certain parts of the animals' range. But, whether from choice or from necessity, vast numbers of Buffaloes, sometimes reaching into the millions, moved northward three or four hundred miles in the spring, and southward in the fall, and this habit is known to have existed for a hundred years. As Seton says: "Theoretically, the Buffalo must have been migratory.

Although it covered a vast region, it continued of one species, whereas, it would probably have split up into several distinct species had it not been continually mixed as the result of migrations."

Reference has already been made to the attacks of Gray Wolves on Buffalo calves. Weak and old Buffaloes also fell victims to these beasts of prey. Still the total number destroyed by them cannot have been very great. Far more terrible enemies were the prairie fires, quicksands, and treacherous ice on the rivers which, combined, were responsible for the death of enormous numbers of Buffaloes. In 1867, more than 2000 out of a herd of some 4000 were engulfed in a quicksand on the Platte river. Prairie fires destroyed whole herds. Alexander Henry, in his "Journal," under date of November 25, 1804, records: "At sunset we arrived at the Indian camp, having made an extraordinary day's ride, and seen an incredible number of dead and dying, blind, lame, singed, and roasted Buffalo." Treacherous ice on the rivers took greater toll of Buffalo life than any other natural enemy of the animal. Under date of May 2, 1807, Henry records: "The number of Buffalo lying along the beach and on the banks passes all imagination. They form one continuous line and emit a horrible stench. I am informed that every spring it is about the same." John McDonnell, in his "Journal," states: "Observing a good many carcasses of Buffalo in the river and along the banks, I was taken up the whole day in counting them, and, to my surprise, found I had numbered when we put up at night, 7360 drowned and mired along the river and in it." The yearly flood on the Missouri river "bore countless Buffalo hulks to be packed away in the Mississippi mud, that in some far geological day will be the rock, all stored with unnumbered bones." Rotten ice on all the northern rivers, totalling in length about 20,000 miles, must also have caused the death of enormous numbers of Buffaloes.

A further natural enemy of the Buffalo was, in the opinion of Mr. Seton, the blizzard. "The great herds that went north in 1870-1 never returned. There is no evidence that any large numbers of them were killed by hunters, red or white, and there is, therefore, but one reasonable explanation of their disappearance. They were exterminated by the blizzards of 1872. Further, I believe that, all times, the Dakota blizzard has taken heavier toll of the Buffalo than even the Dakota Indian did."

It is interesting to note that besides all these enemies the Buffalo had one little companion and friend — the cowbird or Buffalo bird. "Sometimes the cowbirds walk sedately behind their grazing monster; sometimes they flit over, snapping at flies; often they sit along the ridgepole of his spine." In the winter of 1900-01 in the herd at Silver Heights, near Winnipeg, a cowbird "remained with the Buffalo, especially with the biggest bull of the herd. Its food was of the Buffalo's food; by day, it flitted near or warmed its toes in the wool of the animal's back, by night it snuggled on a sort of hollow it had made in the wool just behind his horns."

The Buffalo unmolested attains to a ripe old age. Colonel Jones relates that he has frequently seen wild Buffaloes so old that their horns had decayed and dropped off.

In domestication the Buffalo breeds freely, and it has been crossed with the domestic cow.

The economic value of the Buffalo has been great. Its flesh has sustained thousands of red men and white; its hide, tongue, and horns have been regular articles of commerce. Mounted heads have fetched $400 or more.

No one who has not seen a wide plain covered by Buffalo can gain any idea of their countless numbers, only a very few years ago. Here are the impressions of one eye-witness, Col. R. I. Dodge, who in 1871 saw one of the immense herds while traveling in Arkansas. For twenty-five miles he passed through a continuous herd of Buffalo. "The whole country appeared one great mass of Buffalo, moving slowly to the northward; and it was only when actually among them that it could be ascertained that the apparently solid mass was an agglomeration of innumerable small herds of from fifty to two hundred animals, separated from the surrounding herds by greater or less space, but still separated. The herds in the valley sullenly got out of my way, and turning, stared stupidly at me, sometimes at only a few yards' distance. When I had reached a point where the hills were no longer more than a mile from the road, the Buffalo on the hills seeing an unusual object in their rear, turned, stared an instant, then started at full speed directly toward me, stampeding and bringing with them the numberless herds through which they passed, and pouring down on me all the herds, no longer separated, but one immense compact mass of plunging animals mad with fright, and as irresistible as an avalanche. Reining in my horse I waited until the front of the mass was within fifty yards, when a few well-directed shots split the herd, and sent it pouring off in two streams to the right and left. When all had passed they stopped, apparently perfectly satisfied, many within less than 100 yards. From the top of Pawnee Rock I could see from six to ten miles in almost every direction. This whole vast space was covered with Buffalo, looking at a distance like a compact mass."

The history of the Buffalo and its practical extermination as a wild animal reads like a tragedy. It has been so often recounted that only a few salient facts need be mentioned here. It is safe to put the primitive number of Buffalo at 50,000,000 to 60,000,000; in 1850, there were probably remaining 20,000,000; in 1870, only 5,500,000 were left; in 1888 (including some in captivity), a meagre 1,300; and about 1895 the remnant had probably dwindled to 800. To-day, thanks to the efforts of the governments of the United States and Canada, the New York Zoological Society, the American Bison Society, and certain public-spirited individuals, the Bison is breeding rapidly in parks and private preserves. In 1912 it was estimated that there were in North America 2,907 living Bison, and since then the increase has continued, several small herds being in a thriving condition.

By permission of the New York Zoological Society

THE LAST OF MANY MILLIONS

The Wichita herd of Bison is one of the few groups being carefully preserved

MUSK-OX

Ovibos moschatus *(Zimm.)*

General Description.— A somewhat small wild ox standing about 50 inches at withers. Both sexes horned, horns of male, however, much the larger. Horns never shed, rough and grooved at base, bending abruptly downward from occiput where they nearly meet in midline, tip curving upward and forward but not passing above level of eye. Horns blackish at tip. Neck short. Muzzle hairy, with small triangular naked space between nostrils. No facial glands. Tail rudimentary. Hoofs broad, asymmetrical, with large lateral hoofs. Pelage long, shaggy. Color dark brown, except for saddle-shaped patch of yellowish on mid-back. Hair very long and moderately soft. A dense woolly undercoat of soft hair.

Dental Formula.—Incisors, $\frac{0-0}{4-4}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{3-3}{3-3}$; Molars, $\frac{3-3}{3-3}=32$.

Pelage.— ADULTS: No marked seasonal change except that the shed underfur in summer gives animal patchy appearance. Sexes alike. Everywhere dark brown with head, neck and sides of body tending to blackish in adult males. A saddle-shaped patch of yellowish-white over lumbar region. Feet whitish. YOUNG: Very much as adults.

Measurements.— Length, male, 6 to 6½ feet; height at shoulder, 4 to 4½ feet. Horns, along outer curve 22 to 30 inches; width at base, 9 to 12 inches; tip to tip, 15 to 25 inches. Weight, 400 pounds. Female, slightly smaller throughout; horns decidedly smaller, not so wide or ridged at base.

Range.— Arctic America from Mackenzie River and north of 60th parallel, south to Melville Bay.

Food.— Grasses, moss and lichens.

Remarks.— A sturdy wild ox well adapted to Arctic life by the possession of a dense coat of long hair, wide hoofs to bear it upon snow, and a faculty of subsisting on a scanty diet of moss and lichens when everything is covered by snow.

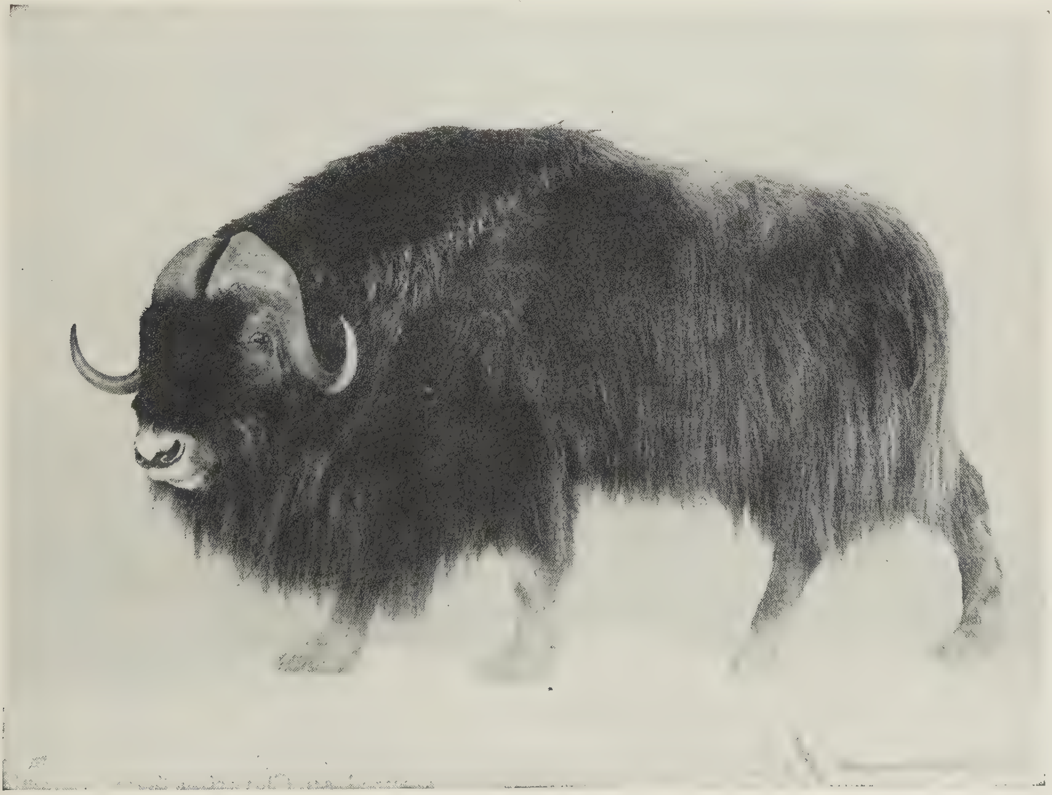
RELATED SPECIES

Common Musk-Ox.— *Ovibos moschatus moschatus* (Zimmermann). The typical form. Arctic America from west side Hudson Bay to Banks Land.

Melville Island Musk-Ox.— *Ovibos moschatus melvillensis* Kowarzik. Melville Island.

Hudson Bay Musk-Ox.— *Ovibos moschatus niphoecus* Elliot. Blacker in color, horns lighter, little white on head. Region to the northwest of Hudson Bay.

Ward's Musk-Ox, or White-faced Musk-Ox.— *Ovibos moschatus wardi* Lydekker. White space between horns and on face, also generally whitish on sides of head. More white on feet. General color lighter. Eastern Greenland.



Photograph from the American Museum of Natural History

MUSK-OX

Living in the snow-clad wastes of the Arctic Circle, it is hard to see how this animal maintains life, where the vegetation is scanty and hidden

The Canadian Barren Grounds, a stretch of country extending westward from Hudson's Bay to the Mackenzie river, are among the most desolate regions on the face of the earth. Even in the continuous sunshine of the short summer, ice is to be found in the lakes till the month of July; and it frequently happens that the young of the water-fowl are frozen into the early autumn ice before they are strong enough to fly, and ripe berries are covered by the snow before they can fall. In this inhospitable territory, year in, year out, dwells the Musk-Ox, neither true Ox nor true Sheep, yet partaking of the characteristics of both. In prehistoric times, the range of this animal was a very extensive one. Professor Henry F. Osborn records the finding of fossilized bones of the true Musk-Ox or of extinct species in Eschscholtz Bay, Alaska, and as far south as Kentucky; while in the Old World the animal roamed over northern Asia, and in Europe remains have been found as far south as France and Germany.

The Musk-Ox is an odd-looking animal, and has been not inappropriately described as resembling a huge hairy ram, its remarkable horns contributing largely to this similarity; but its stout and short legs give it the appearance also of a small Ox. It stands about four and one-half feet high, and has a length of about six and one-half feet. The head is massive, especially in the older males. The pupils of the eyes are bluish-purple and elongated, and the iris brown; and the ears are so short that, like the tail, they are concealed by the animal's long hair. The hoofs are peculiar, the inner half of each being pointed while the outer half is rounded. Its hairy coat is warmer than that of any other mammal, and consists of an outer covering of coarse hair, which curls and is matted on the back, but elsewhere is more than a foot long, and conceals the upper half of the legs. Next the skin is a growth of fine wool, so dense as to be impervious to moisture. But the most noteworthy peculiarity of the Musk-Ox is its horns, which grow at first in a horizontal direction. The downward bend does not appear till the second year, and the horns are not fully grown till the sixth or eighth year. The horns of the bull grow into an almost solid boss on the top of the head.

The food of the Common Musk-Ox consists for most of the year of mosses, to obtain which it scrapes away the snow with its hoofs. The Greenland species has been seen to use its horns also for this purpose. In summer, according to Mr. Warburton Pike, it " feeds exclusively on willow leaves, which appear to give a great amount of nourishment." The fat accumulated by the animal in the summer serves also to nourish it during the long winter.

Mating begins in September, and the calves, usually one at a birth, are born in May or early in June. From what Mr. Pike could gather from the Indians, the cows calve only every second year. The big bulls are seen wandering singly in the summer, while the young bulls and the cows keep together in small bands. "Towards autumn the bands increase in size, and it is not uncommon to see forty or fifty animals together at this season of the year."

The specific name of the Musk-Ox is derived from its strong odor. The similarity of this odor to musk has, however, been denied by some hunters; and all who have fed on the animal say that if the carcass is promptly and properly eviscerated there is no taint to the flesh, which is juicy, tender, and excellent eating.

Although the Eskimo hunt the Musk-Ox for its pelage, which they use for bedding as well as an article of barter, the fact that the skins are in their prime in winter, when the difficulties of the chase are greatest, operates to prevent any large reduction in the numbers of the animal; for " failure to find the game must inevitably end in starvation and a desperate retreat with uncertain results." In summer the animals are killed by the Barren Ground Indians for the meat and for the skins which can be used for tanning; otherwise, at this season of the year the latter have no commercial value.

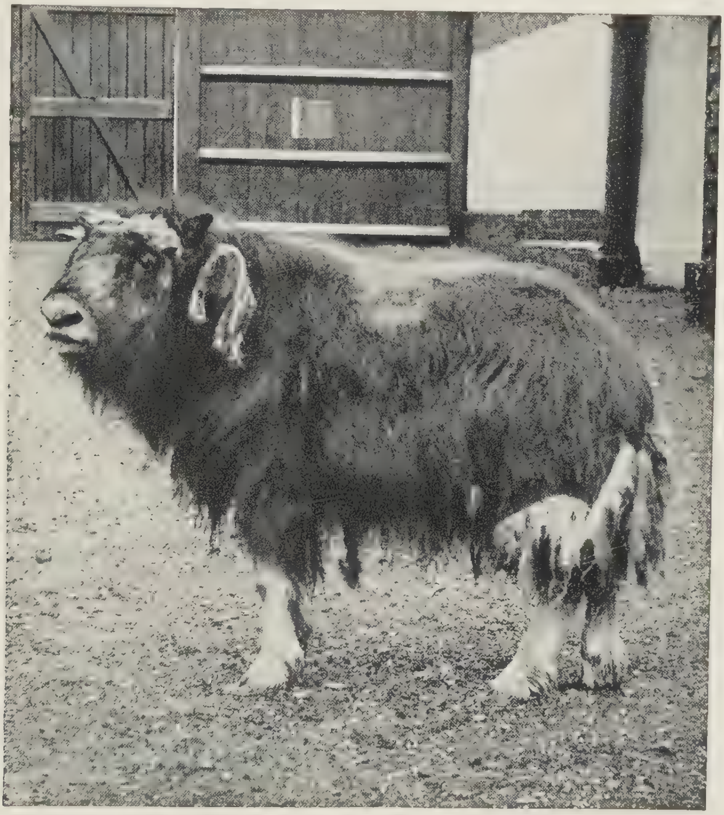
The Musk-Ox is gregarious, and is usually seen in herds numbering from a dozen or so to eighty or a hundred individuals. It has been thought that the animal was migratory; but Mr. Henry Biederbick, of the Greely Arctic Expedition, is of the opinion that the supposition is an erroneous one, at any rate so far as the Greenland species is concerned.

Though the skin of the Musk-Ox has been known since 1670, when the Hudson's Bay Fur Company was founded, it was not until 1899 that a live animal was brought into civilized countries. In that year two calves which had been captured on Clavering Island, off the east coast of Greenland, were bought by the Duke of

Bedford. One of these survived till 1903. The Copenhagen Zoological Garden received a male calf on October 7, 1900. This was fed on "ground oats and wheat bran, with a very little white bread cut in pieces, besides hay (grass in summer) and willow and elm branches throughout the year." At last accounts, the animal was doing well, but attempts to cross it with a Yak Cow and a Frisian Sheep had not met with success.

The killing of a Musk-Ox has saved many a life in the great Arctic wastes. Peary in his book, "The North Pole," writes: "For myself, I never associate the idea of sport with Musk-Oxen — too often in the years gone by, the sighting of those black forms has meant the difference between life and death. In 1899, in Independence Bay, the finding of a herd of Musk-Oxen saved the lives of my entire party. On my way back from 87° 6′ in 1906, if we had not found Musk-Oxen on Nares Land, the bones of my party might now be bleaching up there in the great white waste." Further on he says: "A single Musk-Ox when he sees the dogs, will make for the nearest cliff and get his back against it; but a herd of them will round up in the middle of a plain, with tails together and heads toward the enemy. Then the bull leader of the herd will take his place outside the round-up and charge the dogs."

Of this method of combining for defense, Mr. Pike says: "On the only occasion when I have seen them held at bay by dogs there has been absolutely no attempt at regularity of formation, and the calves were often to be seen in the forefront of an irregular group." The habit is, however, attested by many competent authorities, among whom Mr. Harry Whitney writes: "On gaining the top of the ridge I found thirteen Musk-Oxen at bay, tails together, heads down, in defensive formation. Two dogs, over-venturesome, had been gored to death." He mentions also the fact that "wounded Musk-Oxen display no signs of pain."



By permission of the New York Zoological Society

MUSK-OX

A young Bull that is doubtless longing for its own frozen wastes, where it must forage for food, instead of having regular meals handed in on a fork

A very circumstantial account of this defensive formation of the Musk-Ox is given in Professor Nourse's "American Exploration in the Ice Zone." As it shows how the native hunters turn it to advantage, it is reproduced here: "When the band was surrounded, and as soon as they perceived that the dogs were slipped, they formed into their usual one circle of defence — a Musk-bull battery of nine solid battering heads and twice the number of sharpened horns. The dogs were quickly at these heads, barking and jumping back and forward. After a few minutes watch of the movements of dog versus bull and bull versus dog, In-nook-pro-zhee-jork went forward to within twelve feet of a large bull, carrying a lance which had a line attached by which he could draw it back; but at his second throw the wounded and infuriated bull made a fearful forward plunge, from the effects of which the hunter and his companions escaped only by a very timely jump to the left. The bull was soon again brought to bay. On-ne-la then pulled trigger on another noble bull of the circle of defence, and Pa-pa shot the one which had been lanced, when at the noise of these guns the whole circle bolted away except two, who stood their ground, side by side, long after the whole fight was ended."

ROCKY MOUNTAIN SHEEP

Ovis cervina *Desmarest*

Other Name.— Bighorn.

General Description.— The Rocky Mountain Bighorn is a large wild sheep reaching a weight of about 350 pounds for the male. Body stout. Nose narrow, chin beardless. Ears small, pointed, hairy. Tail short, pointed. Lateral hoofs present, main hoofs large with spongy cushion. Glands between hoofs and below eyes. Head broadest between eyes. Both sexes horned, the horns of the male much the larger. Horns curving regularly backward, outward and downward, in a majestic spiral sweep. Transverse ridges on horns. Horns never shed. Hair of medium length, rather coarse and brittle. Color grayish-brown with patch of whitish on buttocks and above tail. Horns and hoofs blackish.

Dental Formula.—Incisors, $\frac{0-0}{4-4}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{3-3}{3-3}$; Molars, $\frac{3-3}{3-3}=32$.

Pelage.—ADULTS: Not much seasonal variation. Sexes alike. General body color grayish-brown, darkest along dorsal line. Face ashy-gray, neck grayish-brown tinged with plumbeous. Under parts, buttocks, inside of legs, on each side of base of tail, and upper part of throat whitish. Legs dark grayish-brown. Tail above like back. YOUNG: Pelage much as in adults.

Measurements.—Length, male, 5 feet; height at shoulder, 40 inches; tail, 3 to 5 inches; girth around chest, 4 feet. Horns of male, 40 to 50 inches around curve; circumference at base, 15 to 16 inches. Female smaller.

Range.— High mountain ranges from the Colorado River and Arizona into British Columbia.

Food.— Grass, plants and twigs of shrubs.

Remarks.— The Rocky Mountain Bighorn is found for the most part in rough broken country where his peculiar adaptations enable him to elude his enemies. the soft spongy nature of his hoofs giving him sure footing over the most precipitous places. The Bighorn is protectively colored and in response to his habitat has evolved a variety of color schemes in his pelage according to where he is found. It is largely upon this basis that the different varieties of mountain sheep have been classified.

RELATED SPECIES

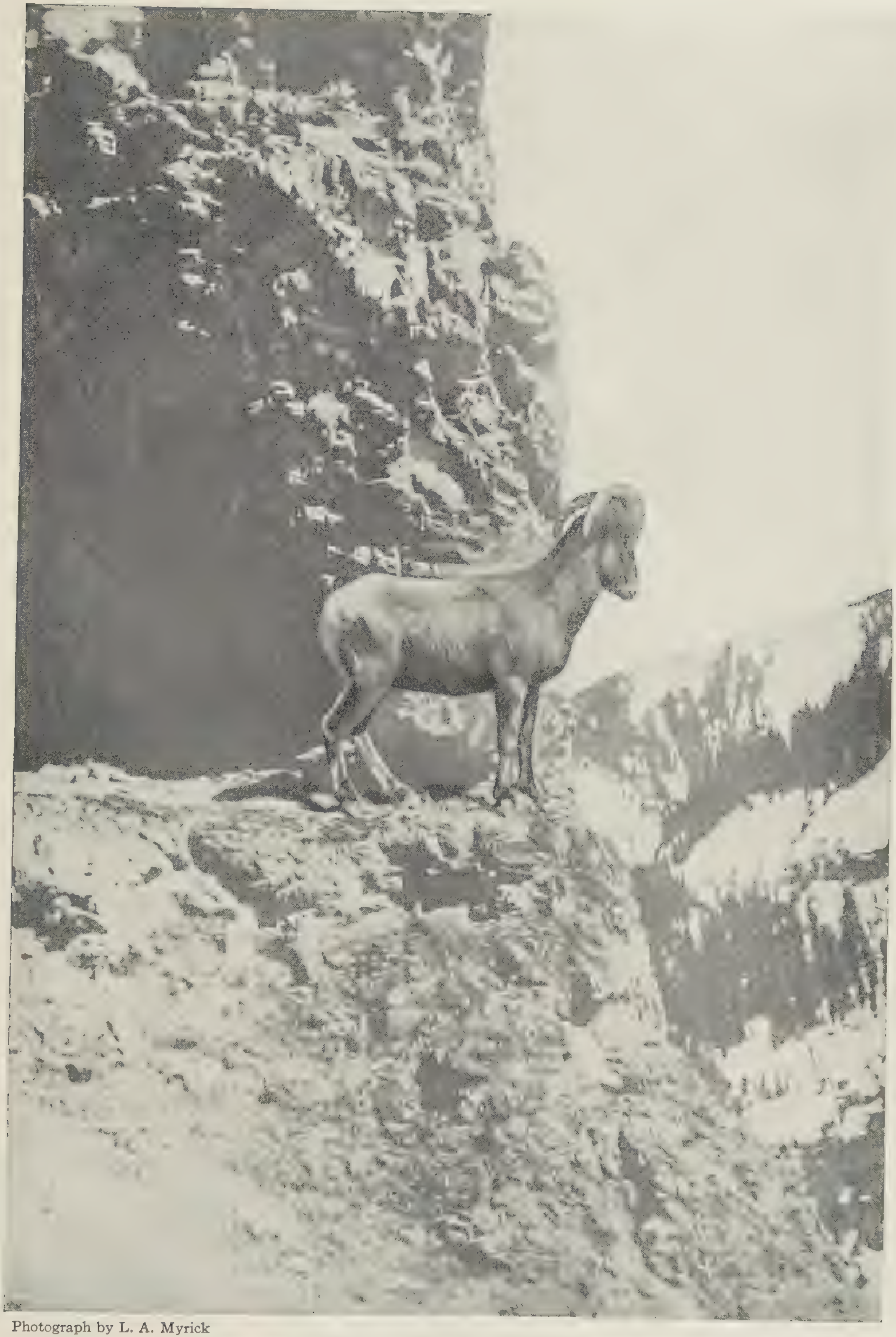
Rocky Mountain Bighorn.— *Ovis cervina cervina* Desmarest. The typical form as described above. Mountain regions from Arizona and Colorado River, north into British Columbia and Alberta.

Audubon Bighorn.— *Ovis cervina auduboni* Merriam. Molar teeth larger, lower jaw heavier and deeper. Bad Lands of South Dakota.

California Bighorn.— *Ovis cervina californiana* (Douglas). Very similar to the typical form. Cascade Mountains of southern Washington and Oregon; Mount Shasta and mountains of northern California; now probably extinct.

Mexican Bighorn.—*Ovis cervina mexicana* Merriam. Much larger ears, horns longer but less massive, paler in color, hoofs larger than the typical form. Texas, New Mexico and Arizona.

Gaillard Bighorn.—*Ovis cervina gaillardi* Mearns. Very small with small feet. Pelage very pale. Rump patch not sharply defined. Arizona.



Photograph by L. A. Myrick

ROCKY MOUNTAIN BIGHORN

In sure footedness and daring the Rocky Mountain Bighorn rivals the Chamois of the Old World. Its native "heath" is well shown in this remarkable photograph

The Bighorn might be called the Chamois of our western mountains, scaling the rugged cliffs and plunging over precipices with the same agility and confidence. The elastic spring of the animal when startled, and the easy poise of the splendid head are exceedingly graceful, and the animal seems built and proportioned to the finest detail for the adventurous life it leads.

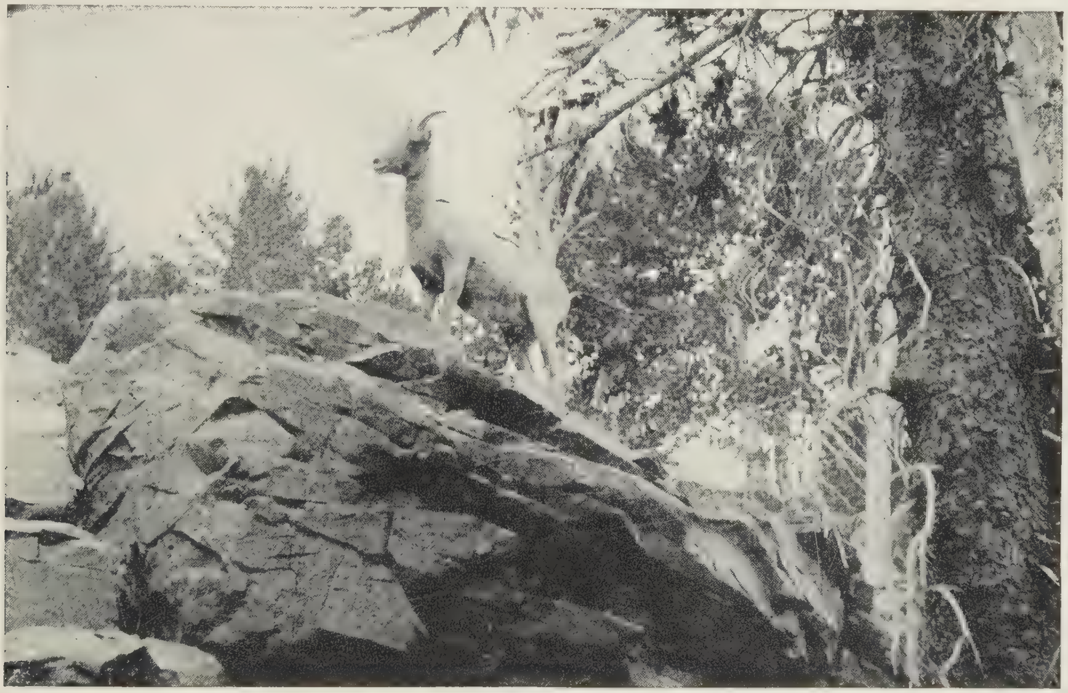
During the breeding season an old ram presides over the flock of ewes and lambs, driving the younger rams off by themselves, as is usual among the polygamous animals. The flocks are exceedingly watchful, and at the slightest alarm are off instantly, selecting a course that few animals or men care to follow. In early spring the Sheep venture farther down into the mountain valleys in search of food, but soon return to their rocky fastnesses among the higher slopes.

From the edges of the Alaskan glaciers to the dry, waterless crags of the Mexican Sierras we find one species or other of the Mountain Sheep. In the "Bad Lands," the easternmost part of their range, Audubon made the acquaintance of these noble animals in 1843. He says: "The parts of the country usually chosen by the Sheep for their pastures are the most extraordinarily broken and precipitous clay hills or stony eminences that exist in the wild regions belonging to the Rocky Mountain chain. Perhaps some idea of the country they inhabit — which is called by the French Canadians and hunters 'mauvaise terres,' may be formed by imagining some hundred of loaves of sugar of different sizes, irregularly broken and truncated at top, placed somewhat apart, and magnifying them into hills of considerable size. Over these hills and ravines the Rocky Mountain Sheep bound up and down, and you may estimate the difficulty of approaching them and conceive the great activity and sure-footedness of this species. They form paths around these irregular clay cones that are at times six to eight hundred feet high, and in some situations are even fifteen hundred feet or more above the adjacent prairies; and along these they run at full speed, while to the eye of the spectator below, these tracks do not appear to be more than a few inches wide, although they are generally from a foot to eighteen inches in breadth. In many places columns or piles of clay or hardened earth are to be seen eight or ten feet above the adjacent surface, covered or coped with a slaty, flat rock, thus resembling gigantic toadstools, and upon these singular places the Bighorns are frequently seen, gazing at the hunter who is winding about far below, looking like so many statues on their elevated pedestals. One cannot imagine how these animals reach these curious places, especially on these inaccessible points, beyond the reach of their greatest enemies, the Wolves, which prey upon them whenever they stray into the plains below."

BIGHORNS GRAZING

These Bighorn Sheep have found a grassy slope to their liking

Generally speaking, the range of the Bighorn extends from the northern States of old Mexico to northern British Columbia, and from the eastern base of the Rocky Mountains to the Pacific Coast. There are many mountain ranges, however, within these limits, in which it has never been found. In Alaska it is replaced by the White Sheep (*Ovis dalli*), and in the Cassiar Mountains by the Black Sheep (*Ovis stonei*). This animal has few characteristics in common with the domestic Sheep. The horns of the wild ram resemble somewhat those of the domestic species, although more massive. The wild ewe has horns from six to eight inches long that curve backward, whereas the domestic ewe has none.



BIGHORN EWE

As it takes its observation from a spur of rock, this mountain ewe completes an ideal study for a sculptor

The lofty crags of the Rocky Mountain National Park are the natural home of the Bighorn. This animal is much larger than any domestic Sheep. It is powerful and wonderfully agile. When pursued these Sheep, even the lambs, unhesitatingly leap off precipitous cliffs. Of course, they strike friendly ledges every few feet to break the fall, but these ledges often are not wide enough to stand upon; they are mere rocky excrescences a foot or less in width, from which the Sheep plunge to the next and the next, and so on till they reach good footing in the valley below. So swift is the descent that, seen from below at a distance, these pauses are often scarcely apparent.

"The Bighorn," says Singer, "is one of the wildest, shyest and most difficult to hunt, successfully, of all American game animals. His habitat being the highest, roughest and most forbidding mountain ranges, it is only by the most arduous toil, wearisome and in many cases dangerous climbing, that the hunter can reach the home of the Sheep at all. After one has toiled for hours he will be fortunate if a capricious current of wind, so often fatal to the success of mountain hunters, does not sweep round in a direction exactly opposite to that from which it has been blowing, and carry the scent of the hunter to the keen nostrils of the quarry."

Persistent killing has largely reduced its numbers. An estimate, made only a few years ago, gave the following figures: Arizona, a few, very widely scattered, small bands; Colorado (after twenty-five years' unbroken protection), 3500; Utah, probably quite extinct; Wyoming, 100; Yellowstone National Park, 210 head, "safe and sound and slowly increasing;" Glacier Park, 700; Idaho, a remnant of, say 200; Montana, 100; Alberta and British Columbia, some fine herds and three preserves in which they are protected. In a large number of States the killing of Bighorn is now prohibited, but there is great difficulty in enforcing the game laws.

The Bighorn is a stoutly built animal, larger than the domestic Sheep, the ram standing about three and one-half feet high at the withers, and weighing about 300 pounds. A very fine ram, killed in Wyoming in 1889, measured fifty-eight inches from nose to root of tail, and had a height at the shoulders of forty inches. The tail was three inches long. The Bighorn has a heavy coat of coarse, stiff hair, resembling that of the Wapiti, and beneath this is a sparse covering of white wool. In summer, this is grayish-brown in color, often with a reddish tinge; in winter, it changes to bluish-gray in the upper parts; the under parts and portions of the legs are white; a dark stripe runs along the back to the tail, which is black and completely surrounded by a conspicuous creamy-white patch on the hind quarters.

Photograph by Max Wilde

A SUSPICIOUS BIGHORN

While the Mountain Sheep are very shy and their protective coloring makes them hard to distinguish, the ewes may be found more frequently than the rams, as the former do most of their browsing during the day

The muscular development of the Rocky Mountain Bighorn is remarkable. As G. O. Shields says: "While possibly not as graceful and elastic in his movements as the Deer or the Antelope, yet he will leap from crag to crag, will bound up over ragged ledges, over ice-glazed slopes, or down perpendicular precipices, alighting on broken and disordered masses of rock with a courage and a sure-footedness that must challenge the admiration of everyone who has an opportunity to study him in his mountain home." At the same time many of the "hair-breadth stories and wonderful pictures of Sheep hunting, in which men climb and cling by their finger-tips to overhanging rock faces," must be considerably discounted.

The fact that the Sheep often plunge head first has given rise to the fable that they land on their curved horns. This is absolutely untrue: they always strike ledges with their feet held close together. As Mr. Shields very pertinently remarks: "A full-grown ram weighs three hundred pounds or more; and while his horns would probably stand the shock of such a fall, his bones would not. His neck, and probably every other bone in his body, would, if he jumped from a precipice and fell fifty or a hundred feet, be crushed to splinters. Besides, if the rams could stand it, and come out of it safely, what would become of the ewes and lambs, which have not the big horns, and which follow whereever the rams lead? A Sheep never jumps down a sheer precipice of more than ten or fifteen feet; and whenever or wherever he does jump, he always lands on his feet." There is no question, however, of the agility of the Bighorn in making its way over crags and rim-rocks; it is often found as high as 12,000 feet above sea-level; and it is equally true that it can dash down declivities whose steepness seems to threaten its certain destruction.

The lambs, one or two at a birth, are born in May or June, and early give evidence of their courage and agility, following the ewes wherever they lead. While the ewes and lambs are feeding, there is always one ewe that acts as sentinel to warn the flock of approaching danger. According to John Muir, "in spring and summer the full-grown rams form separate bands of from three to twenty, and are usually found feeding along the edges of glacier meadows, or resting among castle-like crags of the high summits." In July and August all the Sheep may be looked for on the open tops. In September they feed a trifle lower down. In October they are to be seen most of the time at the tops again. In winter on the Fraser river they may be found on the flatbenches that rise from the river bed; and they have been known to come down even to the level of the ranches.

At the town of Ouray, in Colorado, the citizens put out alfalfa for the Rocky Mountain Sheep in the winter, and have done so for several years. When it is first put out, the Sheep "race down hill" for it. The Sheep "make their appearance after the first heavy snows in December, and stay around until spring, some of them lingering along into April." Although so wild in summer, they will, in winter, come right into the town for their forage.

The wild enemies of the Bighorn are the Puma and the Lynx, and not a few lambs are annually carried off by golden eagles. The flesh of the Bighorn is considered by many hunters to be the most delicious of the mountains.

DALL MOUNTAIN SHEEP

Ovis dalli (*Nelson*)

Other Name.— White Mountain Sheep.

General Description.— See also general description of Rocky Mountain Bighorn. Size and form as in the Rocky Mountain Bighorn, but color entirely different. Color, white, or yellowish-white at all seasons.

Dental Formula.— See the formula given for Rocky Mountain Bighorn.

Pelage.—No noticeable variation, except a clearer tone of white in winter than in summer. Color entirely whitish, hairs usually tipped with rusty. Sometimes individuals have brownish areas, but these do not seem to be confined to any particular spot. Pelage very dense in winter.

Measurements.— Length, male, 5 feet; height at shoulder, 39 inches; tail, 4 inches. Horns along curve, 39 inches; circumference at base, 14 inches.

Range.— Mountains of Alaska and Kenai Peninsula. Rocky Mountains north of latitude 60° nearly to Arctic coast west of the Mackenzie, thence west to headwaters of the Noatak and Kowak Rivers that flow into Kotzebue Sound.

Food.—Grasses and "browse," leaves and twigs of shrubs.

Remarks.— This form is preeminently suited for a life in the snows of the northern regions, and its white coat is doubtless a response to this factor of its environment. There are three varieties.

RELATED FORMS

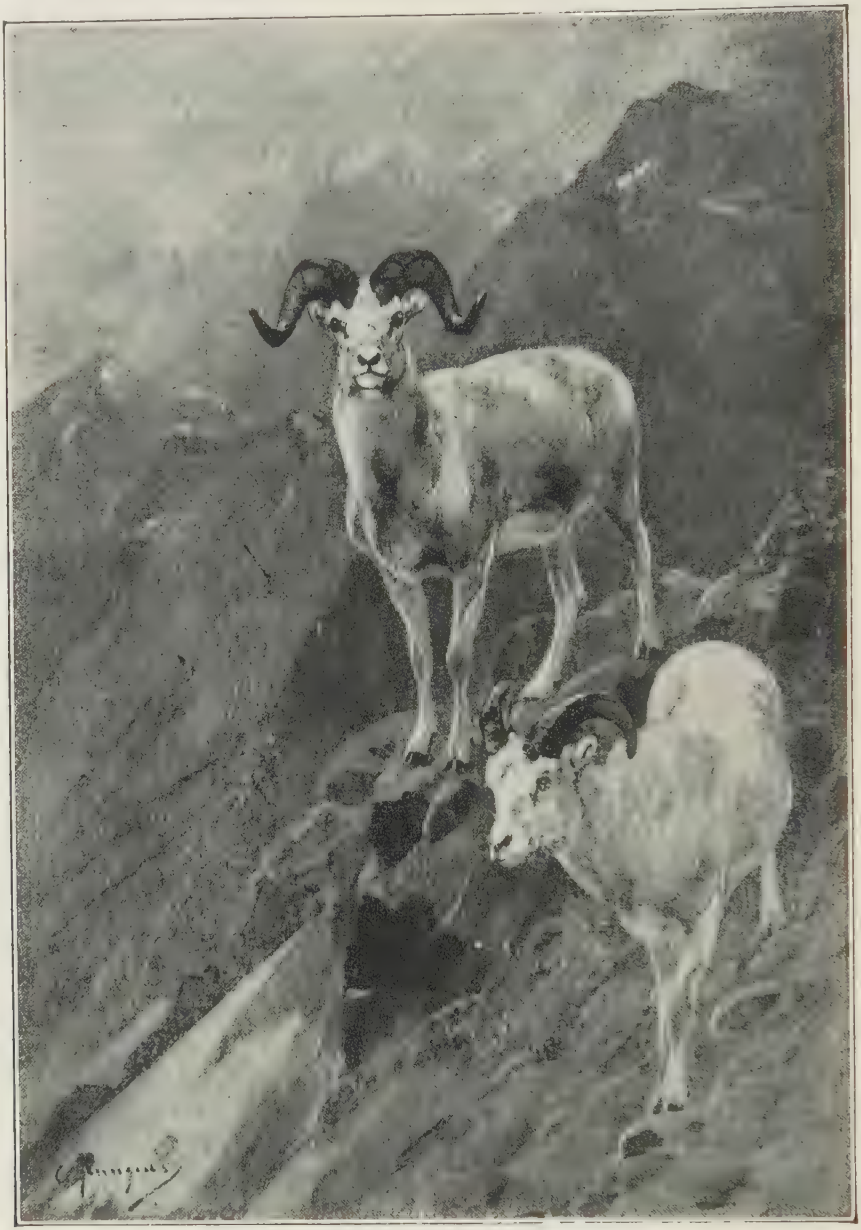
Dall Mountain Sheep.—*Ovis dalli dalli* (Nelson). The typical white Bighorn of the above description. Sub-arctic America in Alaska Peninsula region.

Kenai White Mountain Sheep.—*Ovis dalli kenaiensis* Allen. Grayish-white instead of yellowish-white, tipping of hairs grayish instead of cinnamon. Kenai Peninsula, Alaska.

Fannin Mountain Sheep.—*Ovis dalli fannini* Hornaday. Practically identical with Dall's Sheep. British Columbia and Yukon.

The White Mountain Sheep, as Dall's Sheep is often called, is a very striking species, discovered in Alaska in 1884 by E. W. Nelson, and named by him *Ovis dalli* in honor of Prof. W. H. Dall. From October to the beginning of March its coat is pure white, long and thick; but its texture and color are so delicate that the pelage stains very easily. During the summer months it is of a dirty white hue and very short. Mr. A. S. Reed, who has been a successful hunter of the animal, says: "I killed my first *Ovis dalli* about the first week in September, and was very much disappointed in finding it to be quite short in the coat, and of a dirty rusty color, instead of the pure white that I had expected it to be." He adds: "There is one other peculiarity with regard to the coat of this Sheep — they all have a few black hairs in the end of the tail."

This species is smaller than the ordinary Bighorn, rams being about five feet in length, with a height at the shoulders of three and one-quarter feet. The ewes are somewhat smaller. The horns of a fairly large male measure nearly thirty-nine inches along the curve, and have a circumference at base of fourteen and one-half inches. They are, in the young rams, of an almost transparent amber color, but "the older ones are generally darker, and all of them, after being kept for some time, become just like those of the other varieties." Mr. Reed says that all of his have turned quite black. He has noticed also one marked difference between the horns of Dall's Sheep and those of any other: "The crown or upper surface of the horn projects or overlaps the lower portion, as it were, in such a manner as to form a ridge running for some distance from the base, gradually tapering off until at the distance of from six to eight inches from the skull it ceases to be apparent."


By permission of the U. S. Biological Survey Drawing by Carl Rungius

DALL MOUNTAIN SHEEP

The Dall, or White Mountain Sheep is a northern relative of the Bighorn. It is entirely white in color, to blend with the snow of its home, and there is little variation in its coat for summer and winter

Mr. Belmore Browne has recently contributed to *Outing* some interesting reminiscences of hunting this Sheep. He writes: "No animal lives a happier, lazier life than the mountain ram, in the summer time. The ewes are busy bringing up the lambs; and the young rams, not knowing where they belong, wear the fat from their ribs in futile visits between the staid old rams on the high crags and the mixed bands on the lower slopes. Not so the old patriarchs. Away up on the shoulder of some great wilderness peak they loaf through the summer days. For hours at a time they lie in the soft mountain grass, looking out over the blue sea of the foothills. If they want water, a thousand rivulets fall from the everlasting snowfields; if they are hungry, they feed among the clean wind-swept pastures that lie at dizzy angles above the towering cliffs, and when their hunger is appeased they hunt a soft bed in the sunshine and doze away the happy hours. . . . The lambs are born in the early spring, and it is one of the marvels of nature how the tiny, defenseless things can live through the cold sleet storms common at that time of the year. Luckily their enemies are comparatively few. The Cougar's range ends at about the same northern limit as the range of the Rocky Mountain Bighorn, which is south of the Black Sheep ranges of northern British Columbia. Eagles are responsible for the death of many lambs, and undoubtedly that arch fiend the Wolverene, takes toll from the white bands. I have seen a white ewe spring up in alarm at the approach of an eagle, and stand on the alert by her lamb until the broad-winged marauder had passed."

Fannin's Sheep is a species of Mountain Sheep discovered in 1900 on the Klondike river, Yukon Territory, the specimen being named in honor of Mr. J. Fannin, Curator of the Provincial Museum at Victoria, British Columbia, to which institution it had been presented. It resembles Dall's Sheep to some extent, the general hue being white, with the shoulders, back, fore legs to knee, and hind legs to hock, outside, gray. The rump patch is white, and tail similar to back, but darker. On the front of the fore leg and on front of the thigh, in both cases extending to the hoof, is a brown stripe. It measures about five feet from nose to tail, and has a shoulder height of nearly three feet. Its horns are similar to those of Dall's Sheep, and have a basal circumference of thirteen and one-half inches, and a spread of twenty-one and one-half inches. It is a handsome and striking Sheep.

NELSON MOUNTAIN SHEEP

Ovis nelsoni *Merriam*

General Description.— See also general description of Rocky Mountain Bighorn. Much paler in color, smaller in size, and with smaller teeth than the Rocky Mountain Bighorn.

Dental Formula.— See formula for Rocky Mountain Bighorn.

Pelage.—Upper parts, pale dingy-brown. Underparts and legs, much darker, contrasting sharply with the white areas. Groin, hinder part of belly, inner aspect of thighs and posterior aspect of fore and hind limbs, white. Rump patch white, small, and completely divided by medium line of drab-gray.

Measurements.— Length, male, 50 inches; tail, 4 inches; hind foot, 12 inches; height at shoulder, 33 inches.

Range.— Desert mountain ranges of southern California and northern Lower California.

Food.— Leaves and twigs of shrubs.

This Sheep is a desert-loving variety, living in regions where water is scarce and found only in occasional springs. The pale color and small size are a response to an environment where colors are of a weak tone, and the scanty food supply militates against the size of the animal.

It is one of the smallest of the Mountain Sheep, averaging a little over four feet in length, with a height at the shoulders of less than three feet. It occurs in the mountains of southeastern California and in the peninsula of Lower California. In general characters it bears a resemblance to Stone's Mountain Sheep, but is somewhat paler.

STONE MOUNTAIN SHEEP

Ovis stonei *Allen*

Other Name.— Black Mountain Sheep.

General Description.— See also general description of Rocky Mountain Bighorn. Color darker than the Rocky Mountain Bighorn; horns more slender.

Dental Formula.— See formula given for Rocky Mountain Bighorn.

Pelage.—Above, blackish-brown and whitish mixed. A broad blackish stripe from occiput to base of tail. Face and sides of neck paler. Front of neck, chest and sides almost black. Rump patch, back of thighs, underparts to center of chest, where it ends in a point, and back of legs, white. Outside of legs blackish-brown. Tail black with some white hairs on lower surface. Hoofs black, horns pale brown.

Measurements.— Length, male, 5 feet, 6 inches. Horns over curve, 30 inches; circumference at base, 13 inches.

Range.— From Cassiar Mountains 61° north, south to headwaters of Nelson and Peace Rivers, Rocky Mountains; west to longitude 134°. Found in Stickeen, Cheonnees and Etsezas Mountains, Alaska.

Food.— Grasses and herbaceous plants.

Stone's is a dark form of Mountain Sheep living in the northern Rockies, in regions of bountiful rainfall, which fact has a tendency to produce dark color patterns in all animals. It is often called the Black Mountain Sheep, from its general dark appearance. Its size is about that of Dall's Sheep, but its horns have a much wider spread. A head, at one time in the possession of Mr. Robson of the Hudson's Bay Company, measured fourteen and one-quarter inches in circumference at the base, and had a spread of twenty-eight and three-quarter inches, the horns curving outward at the tips.

This Sheep presents a striking contrast to the White Mountain Sheep. It is blackish-brown and whitish mixed on the upper parts, a broad blackish stripe running to the base of the tail. The horns are pale brown.

ROCKY MOUNTAIN GOAT

Oreamnos montanus (*Ord*)

General Description.— Color, white with black horns and hoofs. Height about three feet at withers. Weight 180-300 pounds. Both sexes have horns which are never shed. Horns ridged and roughened at base and curving gently backward and somewhat outward, those of male being the larger. Horns of young animals short and straighter. Tail short and almost hidden in long hair of rump. Muzzle is haired, there are no facial glands, and in both sexes a beard grows from sides of lower jaw. Ears moderate sized, clothed with short hairs. Shoulders are higher than rump giving animal a humped appearance somewhat similar to that of the bison. A very shaggy animal.

Dental Formula.—Incisors, $\frac{0-0}{4-4}$; Canines, $\frac{0-0}{-0}$; Premolars, $\frac{3-3}{3-3}$; Molars, $\frac{3-3}{3-3} = 32$.

Pelage.—Adults, both sexes: The hair is everywhere whitish from tips to roots. In winter the visible hairs are long and straight, being longest on neck, chest and midline of back from shoulders to rump. Underneath is a coat of short woolly fur more or less exposed in summer when outer coat is shed. A very distinct beard is found on both sexes growing from sides of lower jaw. Owing probably to stain, the tone of the white is seldom pure, but with a yellowish tinge more pronounced in summer. Young: Pelage same as adults, but during the first summer lacking the long hair of the outer coat.

Measurements.— Length, male, 5 feet; tail, 5½ inches; hind foot, 1 foot, 1 inch. Height at shoulder, 3 feet, 3 inches. Horn, along front curve, 10¼ inches; circumference at base, 5¼ inches; from tip across to tip, 5¾ inches. Female, somewhat smaller. Weight of female about one-fifth less than male.

Range.— The higher mountains from Alaska south to California, in former times, now probably only to Idaho. Never found far from regions of heavy annual snowfall. Today found in greatest abundance in British Columbia. By nature, denizen of the Alpine life zone, special preference being shown for localities where crags and cliffs are the features of the landscape.

Food.—Strictly herbivorous. Feeds upon scattered grasses among the rocks, pine needles and, in winter, upon any exposed vegetation it may find.

Remarks.— Erroneously called "goat," this animal is in reality an Antelope closely related to the Himalayan Serow, and is classified in a different section from that containing the domestic goat.

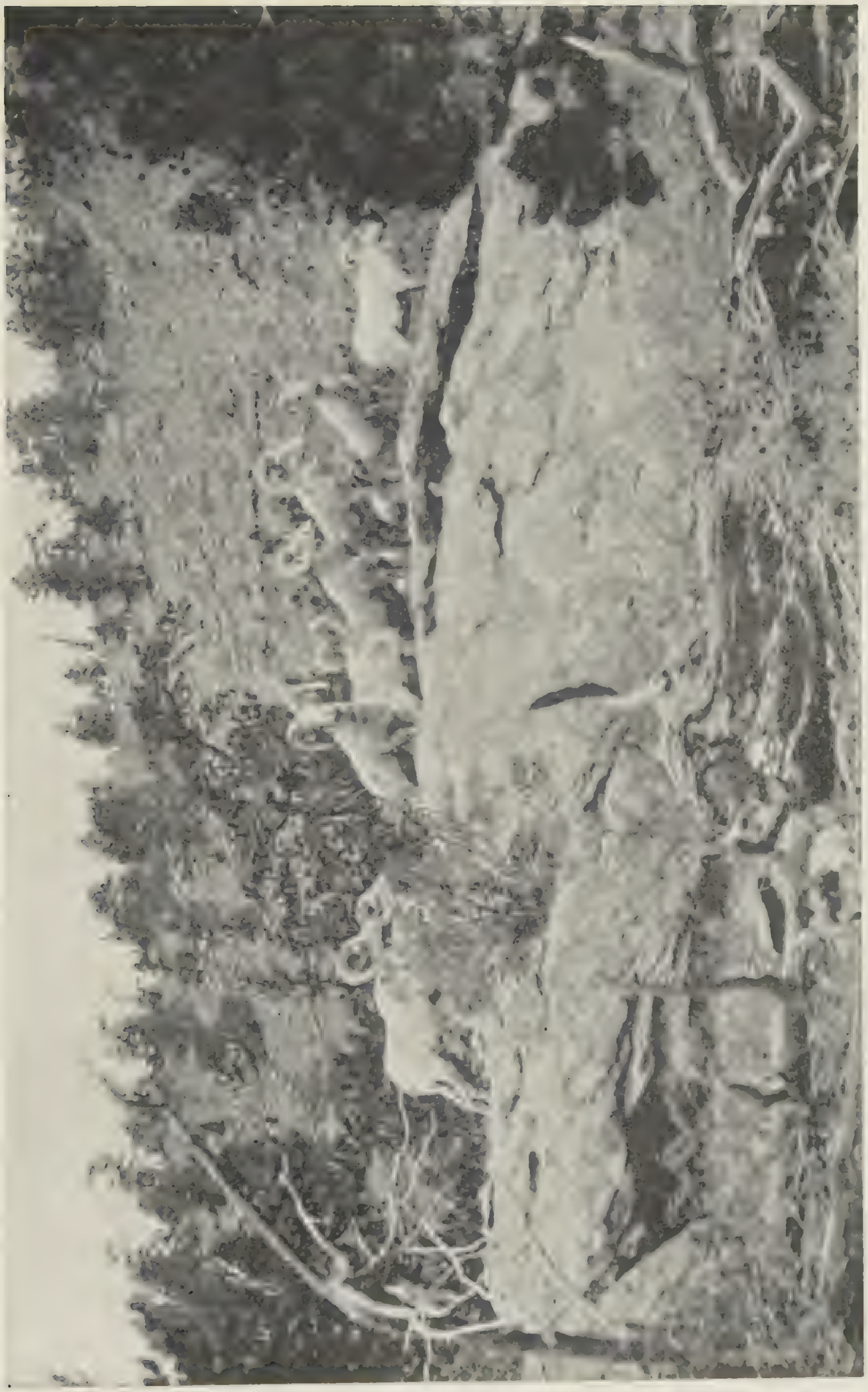
Related Species

Rocky Mountain Goat.— *Oreamnos montanus montanus* (Ord). The animal described above. Ranges in the Cascade Mountains north to British Columbia.

Columbia Rocky Mountain Goat.—*Oreamnos montanus columbianus* Allen. Much larger than typical *montanus*, with longer and narrower skull. Found in British Columbia.

Allen Rocky Mountain Goat.—*Oreamnos montanus missoulae* Allen. Smaller than either of the above, with narrow skull. Found in Montana.

Kennedy Rocky Mountain Goat.— *Oreamnos kennedyi* Elliot. Differs from *montanus* in skull characters, and has larger, more widely flaring horns. Found in southern Alaska.

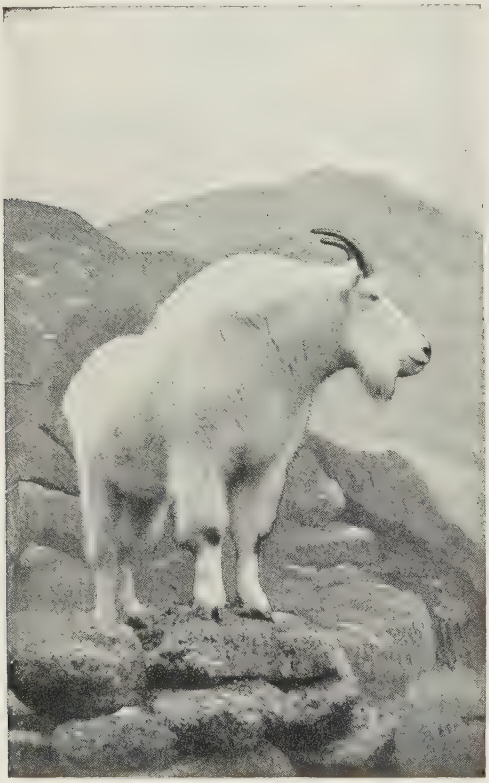


ROCKY MOUNTAIN SHEEP

An unusually large group for one picture, which a patient hunter with his camera was lucky enough to obtain in Colorado

Here we have another case in which an animal has been popularly misnamed. Just as the Pronghorn has been miscalled the American Antelope, it not being a true Antelope, so our friend *Oreamnos montanus* is popularly known as the Rocky Mountain Goat, although it is not a Goat, but rather a goatlike Antelope. It is, in fact, most nearly related to the Alpine Chamois and the Himalayan Serow.

The so-called Goat of the Rocky Mountains is a sturdy animal set on short, stout legs, and weighing somewhat over 250 pounds. Its hoofs, upon which the bold climber has to depend so largely for its safety, are aptly described as consisting "of an ingenious combination of rubber-pad inside and knife-edge outside, to hold the owner equally well on snow, ice, or bare rock." Its horns, present in both sexes, are about ten inches long, rough for about half their length, the remaining portion being smooth, and jet black; they curve backward. The animal stands about three feet high at the shoulders.



ROCKY MOUNTAIN GOAT

This is one of the few animals which are white at all seasons of the year. The horns and hoofs are jet-black, forming a striking contrast to the beautiful coat

The fleece of the Rocky Mountain Goat is entirely yellowish white, and, like the pelage of the Musk-Ox, consists of a fine wool next the skin, through which grows an outer covering of long, straight hair. This hair being erect along the line of the back, and longer over the shoulders and hind quarters, gives a double-humped appearance to the animal. From the color of its fleece, it is sometimes called the White Goat.

In spite of the comparative inaccessibility of its haunts, the range of the Mountain Goat is apparently lessening. At any rate, sportsmen and hunters find that it occurs in much smaller numbers than formerly, mainly in the States of Idaho, Montana and Washington, and northward throughout British Columbia. Amidst the grandest, wildest scenery, above the timberline, crossing the faces of precipices that seem almost perpendicular, dwells *Oreamnos* in serene and contented isolation.

The well-known writer Stewart Edward White, who hunted the animal in the Cascade Mountains, a few years ago, gives in *Outing* an admirable description of typical Goat country. Mr. White had been hunting Elk in the dense forests at the foot of a mountain, when one of his companions suggested that they should go to the top and look for Goats, adding "It isn't very far." Says Mr. White: "It was not very far, as measured by the main ranges, but it was a two hours' steady climb, nearly straight up. . . . Three times we made what we thought was a last spurt, only to find ourselves on a false summit. After a while we grew resigned; we realized that we were never going to get anywhere, but were to go on forever . . . and then at last the sudden, unexpected culmination. We topped a gently rounded summit; took several deep breaths into the uttermost cells of our distressed lungs; walked forward a dozen steps — and found ourselves looking over the sheer brink of a precipice. Across the face of the cliff below us ran irregular tiny ledges; buttresses ended in narrow peaks; chimneys ran down irregularly to the talus. Here were supposed to dwell the Goats. We proceeded along the crest spying eagerly. We saw tracks, but no animals. At last we found ourselves cut off from farther progress. To our right rose tier after tier of great cliffs, serenely and loftily unconscious of any little insects like ourselves that might be puttering around their feet. Straight ahead the ledge ceased to exist. To our left was a hundred-foot drop."

Owen Wister says: "It has been stated that in the winter season, like Mountain Sheep, the

Goat descends and comes into the valleys. This does not seem to be the case. He does not depend upon the grass, if indeed he eats grass at all. His food seems to be chiefly the short, almost lichen-like moss that grows on the faces and at the base of the rocks and between them in the crevices. None of the people in the Methon country spoke of seeing Goats come out of the mountains during the winter. I have not sufficient data to make the assertion, but I am inclined to believe that the Goat keeps consistently to the hills, whatever the season may be, and in this differs from the Mountain Sheep as he differs in appearance, temperament, and in all characteristics, excepting the predilection for the inclined plane; and in this habit he is more vertical than the Sheep."

Of hunting them he adds: "There is no use in attempting to hunt them from below. Their eyes are watchful and keen, and the chances are that if you are working up from below and see a Goat on the hill, he will have been looking at you for some time. Once he is alarmed, ten minutes will be enough for him to put a good many hours of climbing between himself and you. His favorite trick is to remain stock-still, watching you till you pass out of sight behind something, and then, he makes off so energetically that when you see him next he will be on some totally new mountain. But his intelligence does not seem to grasp more than the danger from below. While he is steadfastly on the alert against this, it apparently does not occur to him that anything can come down upon him. Consequently, from above you may get very near before you are noticed."

Of all big game animals the Mountain Goat is by common consent considered the most stupid. Mr. White's opinion is that "Goats are either fools or great poets;" and Colonel Roosevelt's pronouncement concerning the animal is: "Verily the White Goat is the fool-hen among beasts of the chase." This was uttered after he had shot a buck, and one of its accompanying does had run off for about a hundred yards and then stopped to look at the Colonel!

Although the White Goat is essentially a mountain animal, Mr. John Fannin has "known Goats to be shot within a few hundred yards of the sea-level, and to be captured while in the act of swimming rivers or wide stretches of salt water."

Except during the pairing season, November, and in the middle of winter, they are not gregarious. The young are born in the spring, and remain with their parents till the following spring, but no large flocks are seen.

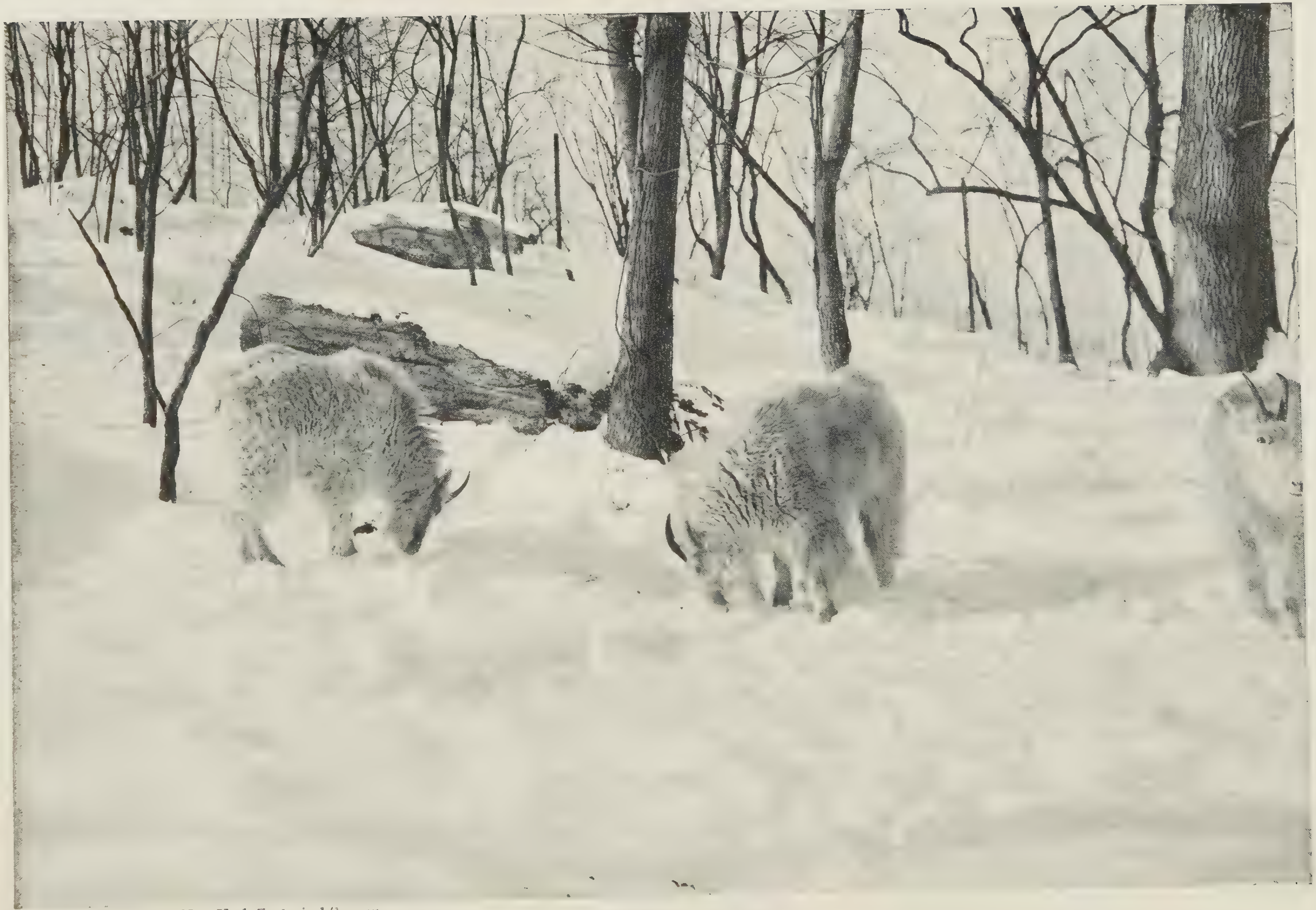
Up to 1903, only four Mountain Goats had been seen in captivity east of the Rocky Mountains. In 1905, Dr. Hornaday personally convoyed a herd of five goats from Fort Steele, British Columbia, to New York, and in May, 1908, the first Mountain Goat ever bred in captivity was born in the Zoological Park in that city. On June 8, 1910, a second kid was born.

ROCKY MOUNTAIN GOAT

Although sure-footed and fearless mountain climbers, the Goats lack the grace and recklessness of the sheep

It was amusing to see these denizens of the mountains clambering over the roof of their house in the Park. The food supplied to them consisted of "best clover hay, crushed oats, sliced carrots, and chopped apples." The legislature of British Columbia a few years ago set apart for the preservation of the Mountain Goat about 450 miles of territory, between the Elk and Bull rivers and around Monroe Lake, since known as Goat Mountain Park, and here a thousand of them found a safe retreat from the insatiable hunter.

The skin of the White Mountain Goat was formerly in demand by the Indians, who made the fleece into blankets, but of late years the demand for these has ceased. Otherwise the skin has no commercial value, and the flesh is not very palatable.



By permission of the New York Zoological Society

ROCKY MOUNTAIN GOATS

Part of a thriving colony now living in the New York Zoological Park

THE PECCARY FAMILY

(*Tayassuidæ*)

PECCARIES clearly belong in a family by themselves. Their nearest relatives are the wild boars of the Old World, and the domesticated swine, but there are well-marked points of difference from these also. The American family contains several species in Central and South America, but only one north of the Rio Grande.

Distinguishing marks are: upper tusks directed downward instead of upward; three toes instead of four on hind feet; a complex stomach somewhat like that of the ruminants; twelve premolars, twelve molars, and a total of 38 teeth; whitish collar, and black dorsal stripe; and a large musk gland in which is secreted a quantity of evil-smelling oily substance.

Fossil remains of Peccaries, some belonging to living and others to extinct species, occur in Pleistocene deposits of both North and South America. In addition to these, certain extinct Pliocene and Miocene hog-like animals seem to indicate the parent-stock from which both the Peccaries and the true pigs have been derived.

COLLARED PECCARY

Pecari angulatus (*Cope*)

Other Name.— Texas Peccary, Musk Hog.

General Description.— A small pig-like animal of about 40 pounds weight. Sexes similar. Tail rudimentary. General appearance black, grizzled with grayish, white. A large scent or musk gland just under skin of rump. A broken whitish collar just in front of the shoulders, and a mane of long erectile hairs from occiput to rump. Strong straight tusks just visible beyond lips. Toes, four in front, three behind. Hair coarse and bristle-like.

Dental Formula.— Incisors, $\frac{2-2}{3-3}$; Canines, $\frac{1-1}{1-1}$; Premolars $\frac{3-3}{3-3}$; Molars, $\frac{3-3}{3-3} = 38$.

Pelage.— Adults: Above, the hairs are black with grayish white annulations giving a somewhat grizzled appearance most noticeable on muzzle, cheeks and under side of head. A mane of black hairs, conspicuously longer than the other hairs, runs from back of the ears to the scent gland on the rump. An incomplete "collar" of soiled whitish runs from just before the shoulder obliquely upward and backward to the mane which breaks the continuity of the collar. Ears with five stripes of white hair internally, blackish externally. Below, the hairs vary from reddish-black along the ventral line to brownish-gray along groin and pit. Hairs everywhere long, hard and glossy. Young: At first brownish-yellow touched with black above, plain yellowish-gray below. A black stripe in the position of mane of adult, whitish collar and annuli of adult reddish in young.

Measurements.— Total length (sexes same size) 3 feet, 2 inches. Height at shoulders, 32 inches.

Range.— Plains and desert areas up into lower mountains from Northern Mexico into Texas.

Food.— Roots, acorns, pecans and miscellaneous vegetation.

Remarks.— This animal is the only native "pig" found in the United States. However, while superficially bearing a close resemblance to the Old World pigs, the common domestic swine, it is a member of a distinct family based upon important internal structures.

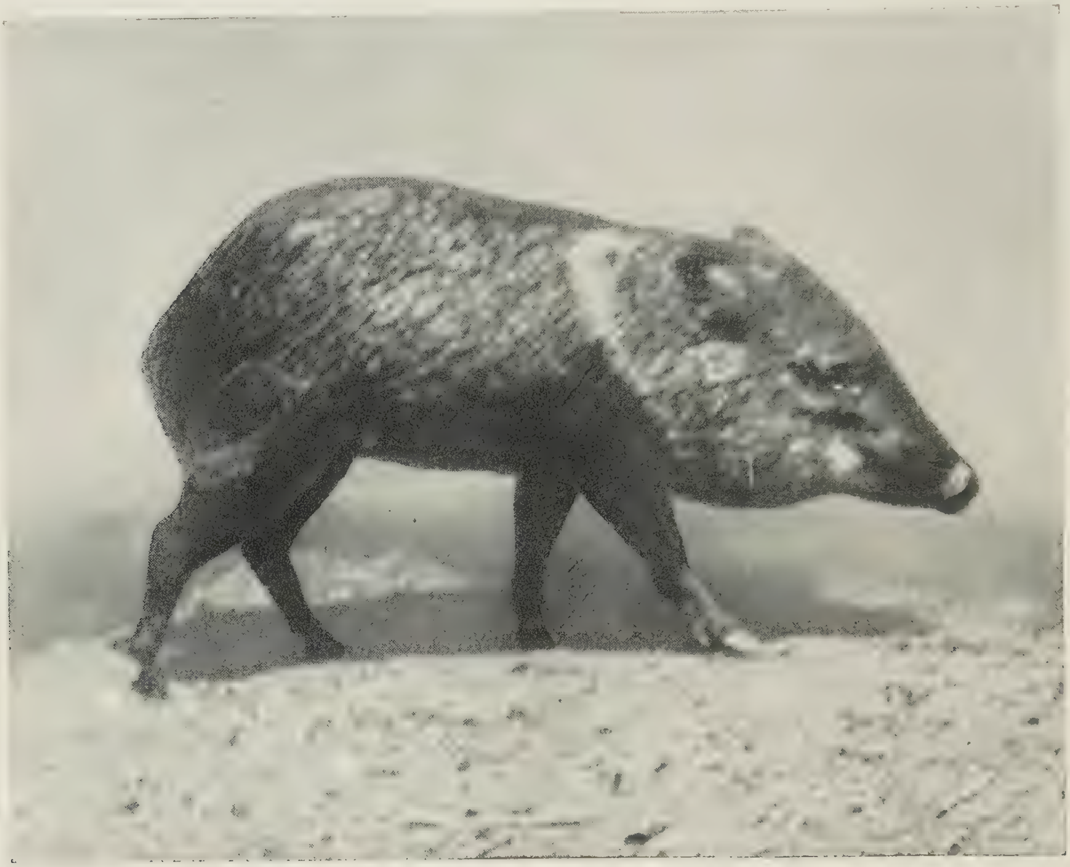
RELATED SPECIES

The Peccaries are a compact group containing several quite distinct varieties in Central and South America, but only one well-established species with its subspecies north of the Rio Grande. These subspecies are all very much alike.

Collared Peccary, or Texas Peccary.— *Pecari angulatus angulatus* (Cope). The animal above described.

Sonora Peccary, or Yaqui Peccary.— *Pecari angulatus sonoriensis* (Mearns). Larger and paler than the Texas Peccary. Sonora, Mexico, and region between Texas and Gulf of California.

The Peccaries are the American relatives of the wild boars of the Old World, but there are certain well-marked differences between the two groups. The points of the upper tusks of the Peccary are directed downward instead of upward as with the swine; the Peccary has no external toe on its hind feet; it has a rudimentary tail, and a complex instead of a simple stomach. In the middle of the back the Peccary has a large gland containing an oily substance smelling somewhat like musk; hence the animal is sometimes called the Musk Hog. When in anger the Peccary ejects this substance, the odor emitted is very rank.



COLLARED PECCARY

The wild relative of the pig tribe, sometime called the Musk Hog, is fond of the jungles of tropical America, but is also at home among the cactus and sage of our southwestern states

In appearance the Collared Peccary resembles a small common hog. The range of the American species extends from the Red River of Arkansas, latitude 34° south through Mexico, Central and South America to the Rio Negro of Patagonia. Elliot says of the Peccaries: "These animals are fearless and pugnacious, associate in droves, sometimes of considerable numbers, and, when attacked, all assume the offensive, and are capable of doing much damage with their sharp tushes; and a man in the midst of a number of enraged Peccaries is fortunate if he is able to find a tree to climb, that being about the only method of saving his life." Mr. A. G. Requa, relates an experience of his when treed by Peccaries in Mexico. He had just shot a wild turkey, and, being warm, had sat down on a rock to rest, taking off his coat. "I had not sat there," he writes, "more than five minutes before I heard the sharp noise of the Peccaries. They came in sight not more than twenty yards below me. I fired at one, and, just as I intended, only crippled him. He set up a great squealing, and sure enough, here they came! I was just a little excited, and started for a tree, forgetting my coat and turkey. I had scarcely time to get up when they were around the tree, and, instead of twelve, they kept coming until there were at least two hundred. I commenced shooting, and killed five with my rifle. . . Fortunately, I had both revolvers, and a belt full of cartridges for them; so I went at them. They were chewing the tree, and climbing over each other trying to get at me. I tried to count them, and found that there were over two hundred left, and I had killed twenty-three. The Peccaries showed no signs of leaving. It was now noon, and very warm. They would root around, then come back to the tree, and grunt, and paw, and bite the tree; then they would cool down a little, would go a short distance away, root around awhile, then come back again. I was getting tired of being treed. If only the boys could hear my firing and come over.

" One o'clock came, then two. Three o'clock came, then four, and no signs of the boys. Some of the pigs would feed while others stood guard; then they would change off. I was so tired. I took my belt off and buckled myself to the tree, so that I would not fall out. Seven o'clock! they still camped near me. Then the sun went behind the mountain; darkness came on, and I was thirsty, hungry, and tired; but, worse than all, I was a prisoner. Twelve o'clock! The moon shone brightly, and I could see my sentinels scattered around. Two o'clock! Then came a signal from some of the outside ones; the rest snuffed the air, then away they all went. I unloosed the belt and got down, more dead than alive — so stiff I could scarcely walk. I went first to where I left my turkey and coat. The turkey had been eaten, and my coat had been thoroughly chewed. I started for camp, where I arrived just at daybreak. Two of the boys were out on horseback, hunting for me."

The chief food of Peccaries consists of nuts and roots, in addition to worms, insects, and carrion. The female produces one or two young once a year. The flesh is somewhat inferior to pork, and the musk gland must be removed immediately after the killing; otherwise the meat will be tainted.

There are several forms of the Peccary in Mexico; and in South America occurs the White-lipped Peccary, a larger species than the Collared variety; it congregates in very large herds, and does much damage to growing crops. Its lips and breast are white.

ORDER OF FLESH-EATING ANIMALS

(*Carnivora*)

FLESH-EATING mammals are known by the Latin name *Carnivora*, which means "Flesh-eaters." The order is also known as *Feræ*, and comprises a wide circle of beasts of prey which live on flesh usually killed by themselves. Most of the members are fierce and active, the larger ones being dangerous to man.

Because of their flesh-eating habits, we find this order distinguished by having certain teeth especially sharp and powerful. The teeth are of three sorts, incisors, canines and molars. The canines are prominent and dagger-like as a general rule, while one or more of the molar teeth have prominent shearing edges forming the so-called "carnassial" or flesh tooth. The lower jaw is articulated in a manner to secure strength and freedom in an up-and-down plane. The clavicle is absent, or at best incomplete. The radius and ulna are distinct bones. The feet of the flesh-eating animals are not so long as in the hoofed animals. The *Carnivora* as a rule walk solidly on the whole foot, instead of daintily on the tip of the toe, and are therefore called plantigrade. They are further provided with sharp claws which can be pulled in, or retracted, by many animals.

The *Carnivora* have two suborders, the *Pinnipedia*, an aquatic group whose feet have been modified into flippers — such as the Seals and Walruses; and the *Fissipedia*, which have several toes on each foot. There are never less than four digits, more often five, and each bears a claw. The first and second digits are never opposable as thumb and finger. The Cats, Dogs, Bears, Raccoons and the Weasel tribe are all members of this suborder. Some of these, the Kodiak Bear for example, may be reckoned as the mammals most to be feared on the North American continent, while at the other end of the series is found a bloodthirsty carnivore, the Pygmy Weasel, small enough to prey on the smallest. Characters common to all these mammals are mobile limbs, adapted for walking, toes free with long sharp claws, external ears well developed, incisors three on each side above and below, stomach simple, caecum present, mammae abdominal. Some of the members of this suborder walk full foot or are plantigrade, others are digitigrade, while still others are midway between the two.

The following diagram illustrates typical members of the *Fissipedia* in North America:

ORDER OF FLESH-EATING ANIMALS (CARNIVORA)

Sub-Order Fissipedia

Families

(In North America)

Dogs
(*Canidæ*)

(Typical species)
- **Coyote**
- **Wolf**
- **Red Fox**
- **Kit Fox**
- **Arctic Fox**
- **Gray Fox**

Cats
(*Felidæ*)

(Typical species)
- **Cougar**
- **Jaguar**
- **Ocelot**
- **Jaguarondi**
- **Canadian Lynx**
- **Wild Cat**

Bears
(*Ursidæ*)

(Typical species)
- **Polar Bear**
- **Grizzly Bear**
- **Big Brown Bear**
- **Black Bear**

Raccoons
(*Procyonidæ*)

(Typical species)
- **Raccoon**
- **Ring-tailed Cat**

Weasels
(*Mustelidæ*)

(Typical species)
- **Weasel**
- **Marten**
- **Mink**
- **Wolverene**
- **Ferret**
- **Skunk**
- **Badger**
- **Otter**

THE DOG FAMILY

(*Canidæ*)

THIS family includes the Dogs, Wolves and Foxes. Their claws are non-retractile, that is, they are fixed, and are not adapted for use as weapons. All members of the Dog family walk upon the front portion of their feet, or are digitigrade. They have five toes on the front feet, and four toes with a rudimentary or imperfect toe above the others on the hind feet.

The Dog Family is not characterized by many admirable traits in its wild state. It is usually cunning, vicious and treacherous, and exhibits no bravery except where there are numbers of its own kind. It is furtive and sneaking, looking for every unfair advantage, and, once in danger, is an arrant coward.

From the commercial side, however, the family is entitled to respect. The pelts of both Wolves and Foxes are of value, those of certain varieties of Foxes bringing high prices.

Photograph by W. L. Finley

THE LONE SCOUT OF THE PLAINS

There is no more typical animal of the western plains than the Coyote

COYOTE

Canis latrans *Say*

Other Name.— Prairie Wolf.

General Description.— Like a shepherd dog in size and appearance. Nose sharp and slender; ears fully haired, erect, pointed. Pupil of eye circular. Tail of moderate length, bushy. Hair long and thick, color buffy gray and black above, below whitish. Carnassial tooth (4th premolar) very large with extensive cutting edge.

Dental Formula.— Incisors, $\frac{3-3}{3-3}$: Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{4-4}{4-4}$; Molars, $\frac{2-2}{3-3}=42$.

Pelage.— Sexes identical. ADULTS: Muzzle pale fulvous grizzled with gray and black; top of head grizzled gray; ears deep fulvous sprinkled with black; upper parts buffy gray and black; under parts and upper lip whitish; throat hairs tipped with blackish;

fore legs and feet dirty white, clay color on outer side; hind legs and feet fulvous on outer side, white on inner side and top of feet; tail tipped with black, underneath white basally. YOUNG: Not so contrastingly marked, the pelage more of a gray monotone.

Measurements.— Sexes practically equal. Total length, 4 feet; length of tail, 16 inches; hind foot, 7 inches; ear, 4¼ inches. Weight, 30 to 40 pounds.

Range.— Northern valley of the Mississippi westward on northern edge of the plains to the Rockies in Alberta.

Food.— Almost entirely carnivorous. Small mammals and birds, mice, hares and cotton-tails, occasional deer or antelope, ground squirrels, prairie-dogs, frogs, snakes and sometimes sheep.

Remarks.— Coyotes of different species are found throughout almost the entire western half of North America from Mexico to Alaska. Accordingly as the influences of environment vary, the species of this genus become differentiated, and authorities recognize today no fewer than 12 to 14 species and subspecies exclusive of the large wolves. The principal variations in characters are to be found in size and coloration, the general appearance of all these forms being sufficient to show clearly their relationships. The most important forms only are mentioned below.

RELATED SPECIES

Coyote, or Prairie Wolf.— *Canis latrans* Say. This form is typical of most of the genus and it is one of the largest. It ranges the farthest north of the group.

Nebraska, or Plains Coyote.— *Canis nebracensis nebracensis* Merriam. Smaller, paler, skull smaller. Arid plains from eastern Colorado and Montana to Assiniboia.

Texas Coyote.— *Canis nebracensis texensis* Bailey. Smaller, brighter and more fulvous than *latrans*. Gulf region of Texas northward as far as Oklahoma.

Mountain Coyote.— *Canis lestes* Merriam. Similar in size and color to *latrans* but skull and teeth smaller. High plains of interior of British Columbia, Washington and Oregon southward over the higher lands of the Great Basin, the Sierra Nevada and the Rocky Mountains to the plateau of Northern Arizona and thence along the continental divide as far south as Mexico.

Oklahoma Coyote.—*Canis frustror* Woodhouse. Smaller than *latrans*, color pale, ears short. Oklahoma.

Mearns Coyote.— *Canis mearnsi* Merriam. Size small, color bright, skull and teeth small. Southern Arizona.

Desert Coyote.—*Canis estor* Merriam. Size small, color pale, teeth small. Deserts of eastern California, Nevada and Utah.

California Coyote.— *Canis ochropus* Eschscholtz. Smaller and darker than *latrans*, more highly colored, ears larger, skull and teeth smaller. San Joaquin Valley, California.

From southern Mexico to northern Alberta in Canada, and from Michigan to the Pacific coast, the Coyote, or Prairie Wolf, may be found pursuing its devious ways. It is much smaller than the Gray Wolf and far less savage; and its foxlike muzzle and ears seem to be an index to its craftiness and cunning. The typical Coyote gained its specific name *latrans* ("barking") from the fact that it habitually barks. Mr. Seton considers "the voice of the Coyote is one of its most remarkable gifts." He thinks that some of the animal's calls are "the outcome of the pleasure it finds in making a noise." Soon after the sun goes down the Coyote begins its "evening song." This is "a series of short barks, increasing in power and pitch till it changes into a long squall. One Coyote begins and immediately two or more join in, making so much noise that newcomers think there must be a hundred wolves out there."

An average male Coyote is about four feet in length, stands a little under two feet at the shoulders, and weighs a little over thirty pounds. The females are less.

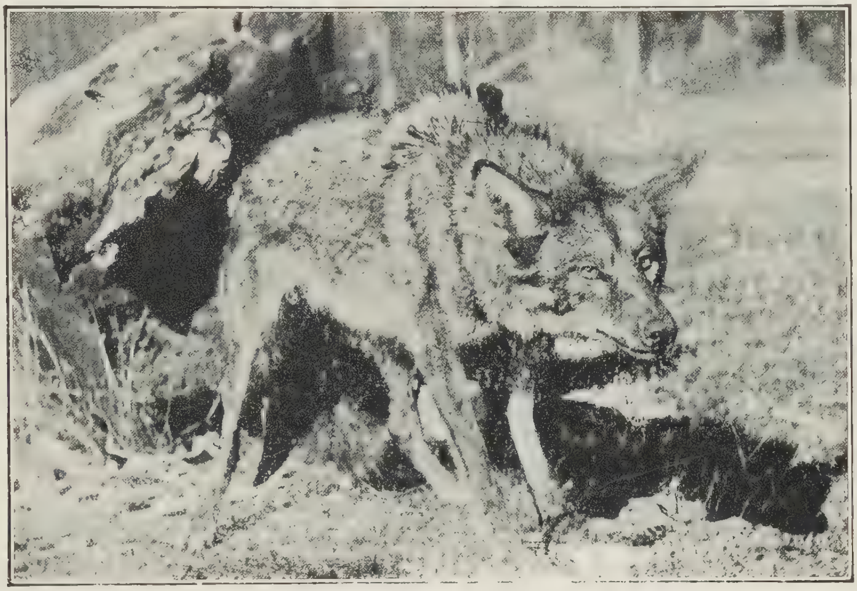
Coyotes mate in February, and the cubs, usually five to seven, but occasionally as many as ten, are born in April. The den is either a hole excavated by the old Coyotes or, it may be, the abandoned hole of some other animal. The eyes of the "little strangers" open on the eighth or ninth day from birth. When they are about six weeks old solid food is brought home to them by the parents. The young leave the home nest in the fall.

The dietary of the Coyote has been described as "every kind of fish, flesh, and fowl that it can master, dead or alive." Turkeys and even sheep it will attack when pressed by hunger, and in some of the Southern States it is said to have developed a liking for watermelon. It will often slink after a hunter and pick up any offal it can. The Coyote shows great cunning in hunting its prey. When after jack-rabbits, a pair of Coyotes will work together; antelope and deer they often hunt in packs, spreading themselves into a wide circle and endeavoring to exhaust the quarry.

The Coyote does not attack man, but shows considerable ferocity with animals of its own size. Mr. G. O. Shields thus describes a fight that he saw between a Coyote and a Wildcat over the shoulderblade of a mountain sheep that he had killed: "The Cat, of course, depended mainly on its claws as weapons, while the Coyote's best hold was with its teeth. The Cat was quicker and more elastic in his movements, while the little Wolf was the more deliberate, and the better stayer. . . . When I first sighted the contestants, they were in the midst of a sanguinary round, but finished it in a few seconds, and, separating, as if by mutual consent, both backed off a few paces and sat down. The Wolf growled and snarled, showed his ivories, and licked his wounds in turn, while the Cat hissed, spat, and caterwauled, much as a domestic cat does when engaged in a family row. Finally the Coyote started for the Cat, and no sooner had he taken a step than the Cat shot into the air, clearing at least ten feet in a single leap, and lit on top of the Coyote. Then there was snapping, clawing, snarling, yawling, howling, and shrieking. Teeth and toenails contended valorously for the victory; the air was filled with hair, and rent with cries of rage and shrieks of pain. . . . When both seemed exhausted, they again drew off. Again they sat nursing their wrath. . . . After the fifth round the rest was much longer than at the end of either of the others. . . . I decided to assume the role of referee, and mentally declaring the fight a draw, took a shot at the Cat. This broke up the affair suddenly."

Though less cunning than the Gray Wolf, the Coyote, as has been stated above, is decidedly crafty. It is an adept in avoiding snares and traps, although hunger often induces it to partake of poisoned bait. It seems to know when a man is unarmed, and will sit undisturbed within gunshot; but when the hunter has his gun it is a different matter. Dr. Hornaday tried twice for two weeks, in Montana, to shoot a Coyote, and could not get within three hundred yards of one, and then only a running shot.

The Coyote has great speed. Mr. Seton places it at its best in the 2.30 class. It, however, when young, falls a prey to the gray wolf, eagle and horned owl.



Photograph by the U. S. Biological Survey

COYOTE AT BAY

The cowardly disposition of the Coyote is shown here, as the animal backs up against a rock, to pose for an unwelcome portrait

A small band of Coyotes hunting together has been known to kill Mountain Sheep which had been shut into a small pocket by an avalanche. Fawns are of course preyed upon in summer and early fall, but the adult Deer only in winter when the crust will sustain the Coyotes, but not the Deer. Forest rangers who have seen Coyotes pursuing Deer in this manner state that a band of five or six will overtake a Deer and hamstring it very quickly on a weak crust of snow. Many calves also are killed by Coyotes in the mountain parks, and in certain localities it is almost impossible to raise chickens and turkeys because of their depredations.

In some parts of the West, until recently, Coyotes were unusually abundant and destructive. Numbers were seen on the plains where they mixed freely with the cattle, and evinced little fear of man unless he carried a gun. During the day one was in almost every extensive weed patch or growth of rank marsh grass, ready to pick up the turkeys and chickens which strayed too far from the ranch buildings. Coyotes have been seen catching Meadow Mice and playing with them like a cat.

Mr. Ernest Ingersoll, in the *Popular Science Monthly,* gives this personal description of a Coyote attacking a mother Antelope and her fawn: "I remember at a place where I was encamped for two or three nights in southwestern Wyoming, the rough ledge of a butteface just across the creek was the home of a family of these Wolves, and I often saw the mother lying at the mouth of their den, and the four whelps gleefully romping in the sunshine. The father of the family kept out of view at first; but later I caught sight of him in pursuit of a doe Antelope and her fawn. The doe was backing away over the plain, keeping the little one, which seemed to understand its part perfectly, close to her hind legs. Following her closely ran the Wolf, often making a dash to the right or left to get at the fawn; but each time the brave little mother, whisking alertly, would present to him her lowered head and make a dash at his skull with her sharp fore-hoofs. Thus she retired, but I fancy that the pursuer's longer breath and varied tactics won the day."

The nocturnal prowlings, secretive disposition, and remarkable craftiness of the Coyote, together with the annoyance it has the power to inflict, cause it to figure prominently in the myths and religious history of the Indians of the far West. The Indians give this animal a curious position in their legends, some paying him high honor for his cunning, while others give him a low place because of his cowardliness. In some of these folk-lore tales he is called "Old Man Coyote," and varied are his advantures.

"In parts of the West where fruit growing and farming are dominant industries," says Dr. A. K. Fisher, "it may be wise to encourage Coyotes and Bobcats within certain limits, provided poultry and sheep are properly protected at night. Numerous ranchmen and fruitgrowers have learned by experience that these animals, if unmolested, will free their premises from rabbits and other crop or tree destroyers. Where Coyotes have been allowed to do their work thoroughly, they are fully appreciated, and many ranchers would almost as soon shoot their own dogs and cats as their wild benefactors. The Coyote feeds on large insects, as May beetles, crickets and grasshoppers, and accomplishes much good."

The skin of the Coyote is not very valuable, being worth, in raw state, about seven dollars.

GRAY WOLF

Canis nubilis (*Say*)

Other Names.— Timber Wolf, Buffalo Wolf.

General Description.— A large dog-like animal, the male reaching a weight of 100 pounds. Nose rather elongate and pointed. Ears moderately high, erect, pointed. Tail of medium length, bushy. Legs powerful and feet large. Hair long and coat heavy. Predominating colors of pelage gray and black with whitish gray below. Claws horn color. Eyes straw-colored.

Dental Formula.— Same as given for Coyote.

Pelage.— ADULTS: Sexes similar; seasonal variation slight. Great range of individual variation in color. Gray or black, sometimes brownish gray or brownish white; many of the hairs black-tipped making irregular wavy black markings which are heaviest in the middle of the back; underfur dusky. Underparts and sides whitish gray, paler beneath; face gray; ears rather fulvous. Tail gray with black markings like back. Outside of legs somewhat fulvous, inside like under parts. YOUNG: Grayer throughout than adults.

Measurements.— Length, male, 5 feet, 2 inches; tail, 16 inches; height at shoulder, 27 inches; weight 75 to 105 pounds. Female, length, 4 feet, 7½ inches; tail, 12 inches; height at shoulder, 25 inches; weight, 55 to 80 pounds.

Range.— In general the Great Plains region.

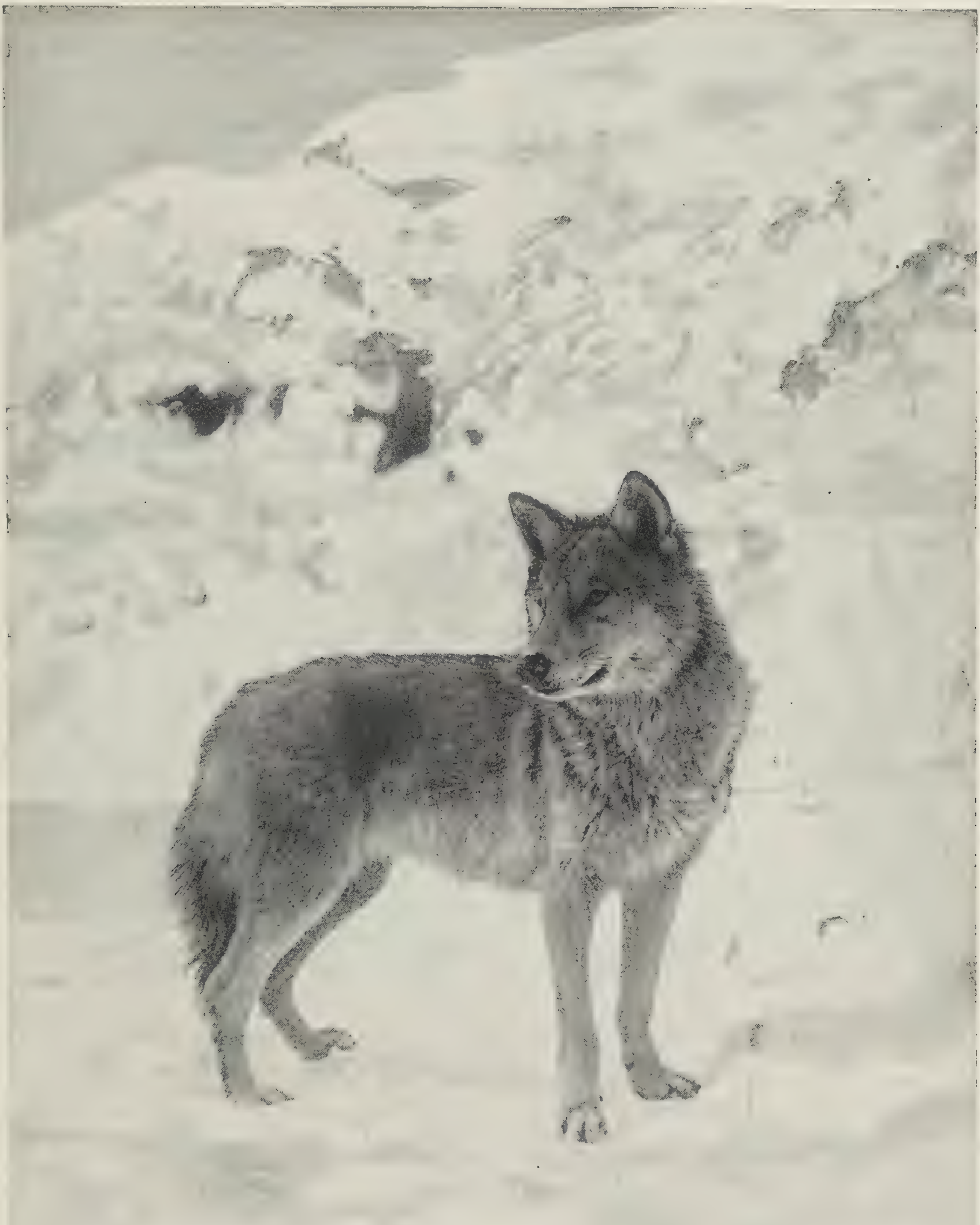
Food.—A meat-eater preying, at times, on almost all of the other animals of the region in which it lives. Principal diet mice, hares, squirrels, deer, the young of elk and moose, and in settled districts domestic cattle, horses and sheep.

Remarks.— The status of the wolf classification is shrouded with some uncertainty, and authorities are not agreed as to the exact number of species to make, or what their ranges should be. The following arrangement of related species is something of a compromise on the best sources.

RELATED SPECIES

Gray Wolf, Timber Wolf, or Buffalo Wolf.—*Canis nubilis* (Say). The typical form, described above. First taken near Council Bluffs, Iowa. Definite range not determined.

Gray Wolf, or Timber Wolf.—*Canis occidentalis* (Richardson). Shares with the above species the common names of Gray Wolf and Timber Wolf. Size very large, color usually light, white to grizzled gray. Color variable sometimes through different degrees of gray to all black. Doubtfully distinct, according to some writers, from Old World Wolf, *lupus.* Canada from plains of the Saskatchewan to Arctic Coast.



By permission of the New York Zoological Society

YOUNG GRAY WOLF

In pioneer days Wolves were a menace to settlers, just as they are today on the plains of Siberia. They still make such serious inroads upon cattle and sheep in the West, that bounties are offered for their destruction

There has been much diversity of opinion among naturalists as to whether the Gray Wolf of North America is specifically identical with or distinct from the ordinary European Wolf. Dr. Merriam, who was supported in his view by the late St. George Mivart, holds that the two animals are one and the same species, but of recent years the opposite view has received an increasing number of adherents. As regards the American Gray Wolf, some naturalists consider it to be identical with the Timber Wolf, while others hold that the two represent different species.

The fact is, that so many variations in respect of shape, size and color exist among the Wolves of America, that it is often difficult to assign a particular Wolf to a certain species.

The Gray Wolf formerly ranged over the greater part of the North American continent, but was most abundant in the great plains. When the Buffalo herds in countless thousands were seeking new pastures, it was the Gray Wolf from which the old bulls had time and again to defend the newly born calves; and many a feeble, wounded, or aged Buffalo also has fallen to the same beast of prey. Reindeer and Moose likewise are among its victims. In Alaska there is a large white variety, and C. J. Jones and a companion, in 1899, above the Arctic Circle, " were so beset by packs of huge and fierce White Wolves, seeking to devour their five living musk-ox calves, that for over forty-eight hours they fought them continuously at short range, killing a Wolf at every shot."

The Gray Wolf is abroad in the daytime as well as at night, and hunts both solitary and in pairs, and, especially in winter, in packs. The early American farmer often awoke in the morning to find that Gray Wolves had during the night killed " fifteen or sixteen sheep, simply tearing open their throats without otherwise damaging the carcasses." And even today in the western ranges Wolves still kill large numbers of sheep, horses, and cattle. The Gray Wolf has wonderful endurance, enabling it to run down and kill even Foxes, whose swiftness is proverbial. Deer and Antelope are favorite prey, although sometimes a large buck has been known to kill a Wolf with a blow of his sharp hoof.

Photograph by Mrs. E. T. Cameron

TIMBER WOLVES

An unusual picture, taken in the open, showing two full-grown specimens at ease

A typical Gray Wolf is about five feet in length, has a height of twenty-seven inches at the shoulders, and is about twenty-nine inches in girth at the chest. Mr. Seton caught " a good-sized male " in Colfax County, New Mexico, in 1893, which measured sixty-two inches from nose-tip to tail-bone tip, its tail being sixteen inches, its chest girth twenty-eight and one-half inches, and its weight 102 pounds. A female taken at the same place weighed only seventy-five pounds. As already stated, the color variation among Gray Wolves is very great. The skin of Mr. Seton's New Mexico specimen was generally a dull yellowish-white; cheeks, chest and inside of hind legs nearly pure white. The outer side of each limb, upper part of the muzzle, and the crown were tinged with a clear pale sienna. From between the eyes, over the head and back were black-tipped hairs ending on the tail in a black spot. The under fur on the under parts was brownish gray, becoming much darker and browner on the upper parts. Below the spot on the tail there was no under fur, but "evidently a skin odor gland." The claws were of dark horn color. Mr. Seton thinks this specimen represents the prevalent color.

Mr. F. R. Burnham gives the following observations on a Wolf hunt: "While following the tracks of two Grizzlies, we came upon a bunch of eleven Wolves; six were black and five were gray. A day or two before they had pulled down a young cow Moose and were making this particular spot their headquarters. Mac and I watched them for over an hour through the glasses. We were probably within 400 yards of them. Their actions were similar to a collie dog's. The youngsters would play, run and jump and roll each other as you have seen dogs do many a time. On the other hand, the older Wolves would snarl and snap at each other, and especially if one was disturbed during his slumbers. After watching them for over an hour we made our stalk and arrived within 100 yards without their having scented us. Upon doing that, they immediately scattered, and I managed to get five out of the bunch. Four were black and one was gray. Of the four black ones, two were in very good coat and two poor. The gray had the best pelt of all. The two poorer pelts of the blacks were a shade between a blue-black and a snuff color. The front paws were a deep tan; also, the throats had a tendency to that shade. The smallest of the five weighed ninety-two pounds; the largest, if I remember correctly, 118 pounds."

Gray Wolves mate any time between the last week of January and the first week of March; the colder the region, the later the pairing. The consensus of opinion among those who have had the most favorable opportunities of studying these animals seems to be that Gray Wolves pair and that the partnership is permanent. The den may be a hollow stump of a tree, a hole in the ground, dug by the parent Wolves, or some natural cave. Sometimes two or three she-wolves will use the same den together. Some observations of a professional wolfer, given below, are informing as to the interior of the den. The gestation period is sixty-three days, and the litters number from three to thirteen pups, six or seven being the usual number. The eyes of the little ones do not open till the ninth day. The she-wolf has the reputation of being an excellent mother, never killing or eating her young as the Prairie Wolf does. She may often be seen turning over rocks to obtain a supply of crickets of which the pups are fond.

The Bad Lands, alkali deserts, and the Hudson Bay Barren Grounds still harbor large numbers of Gray Wolves; but the Wolf of today is comparatively shy, doubtless due to its experience with modern firearms. Indeed, shooting can no longer be depended upon to restrict its numbers. Some observers consider the Gray Wolf a more cunning animal than the Fox. It certainly shows great ingenuity in evading traps; and, although bounties ranging from two dollars to fifteen dollars are offered for its destruction, cattlemen in some States offering as high as fifty dollars for a notorious freebooter, considerable skill and astuteness have to be used to secure one.

A professional wolfer says: "The time to catch the Wolves is when they are going back to their dens; if the dam sees you, she will try to lead you away. There's nothing to be afraid of about Wolves, when once you know their peculiar way of acting. Their jaws and teeth are as stout and strong as a pair of sheep shears, and they are powerful biters, but a Wolf won't fight as long as he can hide his head. Generally at the bottom of the den or hole there is a little space or boudoir where they raise the pups, and at one side of this room there is a little hole. When the hunter crawls into the den, the big Wolf will hide her head in this little hole and think she is safe."

The fur of the Gray Wolf makes a fine robe, and a skin fetches on the London market from seven dollars to fifteen dollars, according to size and quality.

The Gray Wolf has often been crossed with the domestic dog, and in the North such half-breeds have been utilized in drawing sledge trains. In captivity, according to Dr. Hornaday, they retain all their meanness, treachery, and cruelty. "No matter how well yarded, well fed or comfortable, a Wolf will watch and coax for hours to induce a neighbor in the next cage to thrust through tail or paw, so that he may instantly seize and chew it off, without mercy." Other observers tell like tales of its treachery.

Mr. Merritt Cary in "A Biological Survey of Colorado," says: "Gray Wolves were formerly abundant over practically the entire State, except possibly the highest mountains, and were especially numerous on the eastern plains, where large bands preyed upon the Buffalo. From this habit of hanging on the flanks of the large herds, they were generally known as Buffalo Wolves. The mountain animals are said to average much darker than those of the plains. Unfortunately, there are no specimens available from the mountains to settle this point, but it is unlikely that two forms occur in the State. Wolves are still found in considerable numbers in North Park and in Routt and Rio Blanco Counties, where they kill a great many range cattle. A few are probably found throughout the mountains west of the main ranges, and small numbers are still present over the more unsettled parts of the eastern plains region, particularly in Baco and eastern Las Animas Counties, in the extreme southeast, where, in 1907 and in 1910, they were said to be common and to kill a great many sheep. In 1906 Wolves were common over most of the Routt County, notwithstanding the bounty of fifteen dollars authorized by the local stock association, the additional ten dollars offered by the county, and the efforts of several professional wolf trappers employed by the association.

"In Dixon, Wyoming, I saw a nearly adult black Wolf in captivity, which had been captured as a cub. This individual was kept in a large cage in the back yard of its owner in Dixon. A boy of three years was petting and stroking its head through the bars, and the Wolf's every movement betokened its pleasure in the companionship of the little fellow. All playfulness immediately left it, however, on the approach of a man, when the wild, untamable wolf nature was revealed in bared fangs, curling lips, and glaring eyes. The mother of this Wolf was gray, as was also one of the three cubs captured in the den."

RED FOX

Vulpes fulva (*Desmarest*)

Other Names.— See Remarks.

General Description.— Size of a small dog, total length about 3 feet. Fur long and soft. Tail long and bushy. Ears long, erect, pointed. Pupil of eye elliptical. Nose elongate and tapering. Color bright yellowish rufous above, white underneath; feet blackish. Claws long, sharp, non-retractile. Toes, 5 in front, 4 behind.

Dental Formula.— Incisers, $\frac{3-3}{3-3}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{4-4}{4-4}$; Molars, $\frac{2-2}{3-3} = 42$.

Pelage.— Adults: Sexes identical. General color above, yellowish brown or bright yellowish rufous, darkest on back and shoulders; throat, middle of belly and undersides of legs white or whitish, often tinged with dusky; front of legs and feet largely brownish black; terminal half of upper surface of ears dark brown; tail yellowish brown more or less tipped with brownish black; tip of tail white. Young: Muzzle blackish; head dusky with sides of face light yellowish and nearly the whole posterior ear black; tail dusky with white tip.

Measurements.—Male about 1/10 larger than female. Length, male, 3 feet; tail, 14½ inches; hind foot, 5¾ inches.

Range.— Northeastern United States.

Food.— Small mammals, birds, frogs, meadow mice, hares, squirrels, poultry.

Remarks.— The Red Fox group is found over practically all of North America from the Atlantic to the Pacific, and from the Arctic Coast south to about 35° on the Atlantic Coast, and on the Pacific Coast, and in the Rocky Mountains to about 38° latitude. This group is made up of some 16 species and subspecies, all differing, in general, from one another in some variation on the color pattern or in size, often rather minor details. Among many of these species color phases or deviations from the normal color pattern appear. These color phases may appear in a litter with all the other members the ordinary red pattern, and are of three styles: the Cross Fox, the commonest of the color "freaks", the Black Fox, or the Silver Fox, the latter two very rare in occurrence. These phases vary from the normal as follows:

Cross Fox.— Body color variable but showing more or less gray and fulvous. A black streak crosses the shoulders and meets at right angles another running down the line of the back, forming in effect, a cross.

Black Fox.— General color black with more or less white tipping to the hairs. Tail with a white tip.

Silver Fox.—Same as Black Fox but with many more white-tipped hairs, giving a frosted appearance.

Related Species

Common, or Eastern Red Fox.—*Vulpes fulva* (Desmarest). The typical form as described above. Northeastern United States.

Nova Scotia Red Fox.— *Vulpes rubricosa rubricosa* (Bangs). Larger and darker in color. Range restricted to Nova Scotia.

Newfoundland Red Fox.—*Vulpes deletrix* Bangs. Color very pale, varying from yellow and buffy to light straw color. Newfoundland.

Royal Red Fox.—*Vulpes regalis* Merriam. Size large, color golden yellow, shading to whitish yellow on face, legs reddish brown. Northern Plains from Dakota to Alberta, east to Manitoba and Minnesota.

Western Red Fox.—*Vulpes macrourus* Baird. Size large; colors rich; tail long. Mountains of Colorado, Utah and Wyoming.

Sierra Red Fox.—*Vulpes necator* Merriam. About size of the common Red Fox. Color throughout rather paler. High Sierra above 6000 feet altitude in California.

Cascade Red Fox.—*Vulpes cascadensis* Merriam. Size greater than that of common Red Fox. Color pale. Cascade mountain system of Washington, Oregon and into the Sierra Nevada of California.

Alaska Red Fox.—*Vulpes alascensis alascensis* Merriam. A large, long-tailed species; color golden fulvous. Northern Alaska.

Columbia Red Fox.—*Vulpes alascensis abietorum* Merriam. Lighter, longer and more slender skull, Interior of British Columbia and southeastern Alaska.

Kodiak Island Red Fox.—*Vulpes harrimani* Merriam. Largest of the Red Foxes; tail enormous, largest on basal fourth, tapering thence to tip. Kodiak Island, Alaska.

Photograph by S. A. Lottridge

RED FOX

Noted ever since the time of Æsop for its cunning, the Red Fox of today lives up to its reputation. It is the arch-schemer and trickster of the animal kingdom

From time immemorial the English Red Fox has been accepted as the embodiment of speed, cunning, and resource; but Dr. M. G. Ellzey, who has hunted the American Red Fox in Virginia, is persuaded "that, as found in the States of Maryland, Virginia, West Virginia, North Carolina, and Tennessee, the American Red Fox is an animal far superior to the English Fox, in speed, endurance, cunning, and resource, when in front of a dangerous pack. He laughs an inferior pack to scorn." In the matter of daring, there is no doubt that he excels his British cousin.

Perhaps a few reminiscences of Fox-hunting will serve, better than anything else, to give those unacquainted with this clever animal clearer notions as to the scope of Fox sagacity. To begin with, it should be borne in mind that Foxes, unless old and experienced in guile, will not, when hounded, run far away on a straight course, but will circle near the home where they were reared. It is also well to know that Foxes have certain runways through valleys and across hills, through swamps and along water courses, and that these are followed more or less regularly by the Fox, either when pursued or when quietly moving from place to place in search of food. This fact is taken advantage of by hunters, and the runway must be located before success in the hunt can be expected.

In the fall of 1880, Foxes were very plentiful in the State of New York on the hills between the Unadilla and Chenango Rivers. There was scarcely any snow until late in November, and when it did come it was very dry, the wind blowing it from the fields and hill tops, and drifting it along the fences. Notwithstanding the bareness of the fields, thoughts of the old-time sport tempted the more adventurous hunters. Two of these enthusiastic Nimrods set forth with a well-trained hound before the snow had stopped sifting about even in the less exposed places. The hound soon struck a trail, and as the track was fresh he seemed to fly over the snow. The deep-toned baying sent the blood tingling through the veins of both pursuer and pursued. The first hunt of the season was really on! The men took positions of vantage on the supposed runway, watching and listening carefully for the expected game. Meanwhile, the hound had gone quite out of hearing to the north. An hour passed and no Fox appeared. Nothing was heard save the baying of the hound far away to the east. In half an hour the Fox appeared in a valley, over which the hunters commanded a distinct view. As the Fox could not take to the water in the frozen streams, he tried another trick which worked admirably. It was this: Within the valley and in sight of the hunters were two ploughed fields, each containing a marked elevation. The wind had swept these higher areas completely bare of snow and loosened bits of earth had rolled away, until the surfaces were quite smooth. The runway of the Fox may have been across these wind-swept places. Be that as it may, the Fox crossed each in turn. When the hound came upon the first place he lost the trail for a time, but finding it, proceeded to the second. The Fox, instead of continuing his course as would naturally be expected, returned to the first by a circuitous route and then again to the second. He repeated this manoeuvre three times, taking the same course each time, finally quitting the game by turning sharply to the left, and making off to the south, leaving behind him a most weary and perplexed dog.

At another time a Fox was seen to follow a rail fence for about forty rods, nearly in the opposite direction from that in which he had been traveling; he then jumped from the fence upon the ice of a small creek. By this ruse he succeeded in completely eluding the hounds.

The common Red Fox is to be found throughout the northeastern United States and Canada, as far south as the Carolinas. Though fond of the open prairies, it is especially partial to districts in which there are low hills and ravines, or where there is close proximity to cover. What may be termed its home range, however, is about five miles in diameter in summer, and probably twice that distance in winter.

The Red Fox takes its name from the rusty or yellowish red color of its coat. The male is a little over three feet in length, the tail being about fourteen inches long. Its height is about thirteen inches. The female is smaller. In northern Foxes the tail is very large, and Mr. Seton gives the following reason for this: "Its nose and pads are the only exposed part, and these might easily be frostbitten when it sleeps during severe weather. But it is always careful on lying down to draw these together, then curl the brush around them; it acts both as wrap and respirator. . . . I believe a Fox or Coyote would die before spring if turned out in the autumn without a tail."

Its hearing is remarkably keen, and it depends upon this more than upon its eyesight.

The Red Fox mates in February or early in March, and it seems to be fairly well established that the animal truly pairs. The male Fox is an attentive husband and brings food to his mate, whom he assists in caring for and feeding the cubs. The young are born about the first of April; there are four to nine cubs in a litter; and they are born in the den or "earth," which is sometimes excavated by the parents and sometimes is an adaptation of a hole that they have found. Besides the den proper, there is often a space used as a store room. The cubs, which are kittenlike in appearance, do not see till the eighth or ninth day from birth, and they remain in the den till they are three or four weeks old. Though nearly full-grown in August or September, the cubs are still to be found with their parents; they scatter, however, before winter.

The speed of the Red Fox is much greater than that of its gray cousin; it has been known to cover a certain distance at the rate of thirty miles an hour. Dr. Ellzey considers "it is doubtful whether a first-rate specimen of a Red Fox, taken at his best in point of condition, can either be killed or run to earth by any pack of hounds living." The Fox has no regular hours for sleeping or eating; it likes to sleep in the sunshine, and, when tired, "lies down for a nap, not usually in a hollow, but on some exposed place, the top of a bank, a boulder, a log, or a stump. . . . He looks like a yellow stone, and seems to know it."

The Red Fox's dietary is both extensive and varied. For flesh, he partakes of woodchucks, hares, rabbits, and mice, with an occasional young lamb for a change. He has a pronounced fondness for the occupants of henroosts, also partridge, and other ground game. Fish and crabs form other items. Such delicate morsels as frogs and beetles he does not scorn when other food is scarce. He kills large numbers of mice and other destructive rodents, and thus recompenses the farmer to a great extent for the loss of an occasional chicken.

The enemies of the Red Fox are many, Wolves and Lynxes being among the fourfooted ones. Eagles keep a sharp lookout for its young. Fleas are among its pests. It is sometimes subject to rabies. Its extreme age has been estimated at fifteen years.

The fur of the Red Fox is an important article of commerce. In London, in 1912, the number of skins sold by one house alone was 40,300; the total in the previous year having been 58,900. A prime skin is worth ten dollars or more.

Nova Scotia and Newfoundland both have forms of the Red Fox. That of the former is larger and of a brighter rusty red than the common Fox. The Red Fox of Newfoundland is of a paler color and less rusty than the common Fox, with larger hind feet and claws. It is smaller than the common Red Fox.

For other related forms of this numerous and widely scattered tribe see list above. Three important color phases, however, are given further mention below.

CROSS FOX, BLACK FOX, SILVER FOX

The Cross Fox and the Black, or Silver Gray, Fox are merely color phases of the Red Fox, but the importance of the trade in their skins entitles them to separate treatment here. Mr. A. P. Low, in 1887, on the Moose River, Labrador, found a litter containing seven kits. Of these two were Red, three were Cross, and the remaining two Blacks or Silver.

The Cross Fox gets its name from the large cross-mark formed by two dark stripes; one across the shoulders, and the other running down the middle of the back. The color of the tail is darker than that of the Red Fox, and the muzzle, legs, and under parts are black. It has a reddish patch on the side of the neck, and another behind the foreleg. It occurs in British Columbia, Alberta and Manitoba, Alaska, and occasionally in the northwestern States. A first-class dark skin is worth twenty dollars or more.

The Black Fox is a dark edition of the Red Fox. Its general color is jet black. The tail also is black, except the tip, which is white. It is called also the Silver Gray, or Silver Fox, from "the gray rings usually marking the otherwise black hairs of the hinder half of the back, the head, and the thighs, which communicate the peculiar silver luster to the fur."

The fur of the Silver Fox is, next to that of the Sea Otter, the most valuable fur in the world, that is to say, in the present-day fashions, matched skins of good size and texture bringing from $500 to $4,000 each. In the United States, "extra fine" skins have sold for $600 to $1,200 each. The extraordinary prices realized for the furs of this animal have resulted in the establishment of various fox-farms, the center of the Silver Fox fur industry being Prince Edward Island, in the southern part of the Gulf of St. Lawrence. An account of this industry given by Mr. Phil M. Riley in *Country Life in America* (July, 1915), is a valuable contribution to

RED FOX

The fur of this animal is very beautiful, both in color and texture

our knowledge of the Silver Fox; and this fact, combined with the importance of the industry itself, warrants somewhat extensive quotation from this article. Mr. Riley says: "The whole island is virtually a great fur farm, from which the principal income is derived. Of the 2,700 Silver-black Foxes in captivity about 2,500 are there. More recently the breeding industry has been firmly established in a few of the United States along the Canadian boundary, where the climatic conditions have proved to be ideal.

"There are several reasons for preferring furs grown in captivity. Pelts from the wild must be taken when caught, regardless of their condition. . . . Here the breeder has a big advantage over the trapper. Not only may the pelt be taken when the fur is at its best, but by the use of chloroform the killing may be virtually painless and without mutilation. While the trapper may occasionally command top-notch prices, the breeder can do so every time. . . . Another fear that has prevented the establishment of Fox breeding on a firm basis in the United States is that success will attend it only in a bleak northern latitude. The United States Department of Agriculture, however, states that the whole eastern and northern sections of the country as far south as Tennessee, and about all of the Pacific Coast States are suitable for Fox breeding. This is attested by naturalists of the first authority, and has been shown practically in several instances, notably by a large and successfully conducted fur ranch at Whitefield, N. H., of which Otto J. Piehler, of Boston, is president. . . . A 2000 acre tract of land has been purchased in the White Mountain region, embracing three ponds and several streams and mountain peaks, and providing every desirable condition for breeding not only the Fox, but the Mink, Raccoon, Black Muskrat, American Otter, Beaver, and Marten."

In 1910, Silver Fox breeders sold for $4,000 a pair; in 1911, the price jumped to $6,000; in 1912, it became $10,000; in 1913, $15,000; a two-year-old pair that had shown unusual fertility was sold, with a guarantee, for $30,000; and later in the same year the record for guaranteed breeders became $40,000. The Woodbury ranch promises to become famous because of the vigor, stamina, and all-around quality of its breeders. Experts agree that the prime pelts at this ranch for beauty alone would easily bring $2,000 to $3,000, the fur being thick, full, soft, glossy, and of beautiful color sprinkled with white points.

The Silver Fox is monogamous, and the pairing is a matter of utmost delicacy, for both male and female quickly resent uncongenial companionship. This is one of the chief factors in the high cost of mated pairs for breeding purposes. From early in February until June or July, the mated pairs must be unmolested, except by a friendly keeper who goes quietly into the pens with food. The kennels must not be approached or any attempt made to count the litters. Plenty of sleep, quiet, and contented solitude are needed during this period, for the mother is ever quivering with anxiety for the safety of her charges. So great is her love for them that if she fears intrusion or interference, she will kill them that they may be spared from what she evidently fears may be a worse fate.

"The young feed on the mother's milk, but occasionally, if the mother ignores them, they are weaned easily, for they will take milk and crackers as freely as a child. For cubs open their eyes in about three weeks after birth, after which there is less danger. . . . Also for variety of food, fish, fruit, small game, and crickets may be employed; hard tack and ordinary sea or dog biscuit dipped in fresh milk are desirable. Bannock or unleavened bread, shortened with tallow, is often used, and fresh grass is desirable as a laxative. . . . Full feeding for a few weeks helps to make the fur glossy. Some breeders employ honey, molasses, or patent stock food for the same purpose. The cost of feeding a Fox is estimated at ten dollars to fifteen dollars a year, and two men are ample for care and constant watching on a ranch where there are forty to sixty foxes."

Dr. William Young Chapman, writing under the title "Fox Frenzy" in the *Independent* (February 13, 1913), says: "Recently, one of the pioneers in the (fox-breeding) business sold his ranch of twenty pairs to a company, with certain guarantees, for $625,000, and within a few weeks a gentleman from Russia visited 'The Island' and purchased five pairs for $100,000. These are to be shipped to Russia and the industry will be established in that country."

KIT FOX

Vulpes velox (*Say*)

Other Names.— Swift Fox, Long-eared Fox.

General Description.— See general description of Red Fox. A diminutive Fox similar in form and general appearance to the Red Fox. Color much paler; legs shorter. Tail half as long as head and body. No black on ears.

Dental Formula.— Same as that of Red Fox.

Pelage.— Top of head, ears, upper part of body and tail yellowish-gray, darkest on back, hairs tipped with white; sides of neck, flanks and upper portion of legs buffy white, inclining to rufous where it meets the gray of upper parts; a black patch on each side of muzzle, some hairs white-tipped; under parts and legs white; under side of tail buff, tip black.

Measurements.— Length, 25½ inches; tail, 9 inches; hind foot, 3¾ inches. Weight, 4 pounds.

Range.— Plains of Colorado and Nebraska to Saskatchewan. A prairie dweller.

Food.— Small mammals and birds of the region it inhabits.

Remarks.— This is the smallest member of the Red Fox genus. The sub-group to which this Fox belongs differs rather markedly from the other members of the genus in appearance, habitat (dwelling in the open) and consequently somewhat in habits. The color phases of the typical Red Fox group are unknown among the Kit Foxes. The Kit Foxes might be considered as Red Foxes that had left the timbered regions to dwell in open, semi-arid areas and had become bleached out by exposure to the hot sun, as well as suffering a reduction in size.

RELATED SPECIES

Kit, or Swift Fox.— *Vulpes velox velox* (Say). The typical form of the description above. Plains and prairies from Colorado and Nebraska to Saskatchewan Assiniboia.

Merriam's Kit Fox.— *Vulpes velox hebes* Merriam. Larger; paler and grayer. Alberta.

Long-eared Fox.—*Vulpes macrotis* Merriam. Size larger; ears very large; color very pale. Deserts of southern California.

The Kit, or Swift Fox, sometimes called also the Burrowing Fox, is a much smaller animal than the Red and Gray Foxes; indeed it is the smallest (also, in the opinion of some, the prettiest) of all American Foxes. It is found from Nebraska to Colorado and northward over the plains. It derives its specific name, *velox*, from its supposed swiftness of foot; but according to several observers, its speed does not justify the appellation. Mr. Seton ranks its speed as "a little higher than the Coyote." It is only about twenty-five inches long, its form being compact and slender. It stands lower than the Red Fox, and its thickly furred ears are relatively longer. Its feet are clothed with long woolly hairs. Its weight is about four pounds. Its under fur is both long and abundant.

The Kit shows the least cunning of all American Foxes. It is very unsuspicious; and its rapid decline in numbers may be due to the readiness with which it eats poisoned meat that has been put out for Coyotes.

The name "Burrowing Fox" has been given to the animal on account of the skill and speed with which it digs its burrows. From these it seldom ventures far.

Kit Foxes feed on birds and their eggs, insects, and small rodents; and they have been seen to catch prairie-chickens that were asleep in soft snowdrifts. From mating time the male and female remain together the summer through; and from the fact that the former is active in the care of the cubs it has been thought that the pairing is permanent. Comparatively little, however, can be stated with certainty concerning this part of Kit Fox life. The Kit's den is often some distance below the surface of the ground. One that was found on Pawnee Creek, Colorado, by one of Mr. Seton's guides, "was reached by a tunnel about nine feet long and was five feet from the surface. The chamber was nicely lined with grass and contained five young ones. 'Just the cutest, prettiest things he ever saw.'"

Adult Kit Foxes are not entirely devoid of strategy, although they are not, as has been stated above, so cunning as some of the other species. Thus if the old and young are together when surprised, the parents will attract the attention of the dog while the cubs make their escape into the burrow.

Though young Kit Foxes may be easily raised, they do not seem to become really tame. This, at any rate, was the case with the five cubs from Pawnee Creek, referred to above, but Mr. Seton says that this Fox is easily managed and breeds freely in captivity, and he cites Audubon and Bachman's account of a captive specimen that "drank more water than Foxes generally do, seemed anxious to play or wash in the cup which held his supply, and would frequently turn it over, spilling the water on the floor of his cage."

The Kit Fox's skin is not commercially valuable, bringing from thirty cents to one dollar and thirty-two cents. In 1912, one firm in London sold 35,222 skins, which was an average annual sale.

ARCTIC FOX

Alopex lagopus innuitus (*Merriam*)

Other Names.— Blue Fox, White Fox.

General Description.— A small Fox with thick, bushy tail, pelage changing to white in winter. Form of body in all essential details as in Red Fox. Hair long and fine.

Dental Formula.— Same as given for Red Fox.

Pelage.— Adults: *Summer.* Head and upper parts, flanks and outside of legs slate brown, under parts and inside of legs dingy white; tail brownish above, white below, tip white. *Winter.* All pure white.

Measurements.— Sexes practically equal. Length, 30 inches; tail, 10 inches; heel to end of claw, 4½ inches.

Range.— Alaska, from Point Barrow southward. An inhabitant of Arctic regions.

Food.— Principally lemmings, meadow mice, Arctic hares and ptarmigan.

Remarks.— Although for a long time considered as a member of the same genus as the Red Fox, *Vulpes,* the Arctic Fox is now generally considered as being sufficiently distinctive to be a genus by himself. All the members of this genus are very much alike, the main differences being in cranial characters and in size. As all turn white in winter there is no opportunity for any variation in the winter pelage. The Blue Fox is a color phase of the Arctic Fox, and is analogous to the silver phase of the Red Fox.

Related Species

Alaska Arctic Fox.— *Alopex lagopus innuitus* (Merriam). The typical North American form, the animal of the above description. Point Barrow, Alaska, southward and eastward in Arctic America.

Ungava Arctic Fox.— *Alopex lagopus ungava* (Merriam). Slightly larger; cranial differences. Ungava, Canada.

Pribilof Arctic Fox.— *Alopex pribilofensis* (Merriam). Largest of the Arctic Foxes. St. George Island and St. Paul Island, Bering Sea.

Hall Island Arctic Fox.— *Alopex hallensis* (Merriam). Skull shorter and broader. Hall Island, Bering Sea.

"The Fox with a good reputation" would be a good designation for this member of the Fox family. All the naturalists and many others who have come in contact with it have a good word to say for the Arctic Fox. Mr. Witmer Stone says: "The Arctic Fox is in many ways the most attractive of its race, being wholly free from the rank odor characteristic of the other Foxes. . . . In its family life it is certainly the equal, if not indeed the superior, of many of

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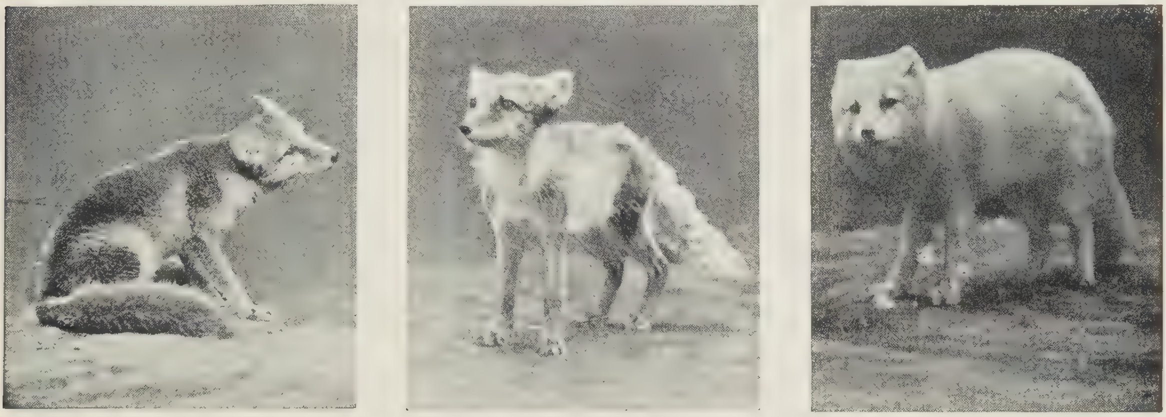
ARCTIC FOX

This photograph gives a good idea of the extremely soft and rich coat of the Arctic Fox, during the winter months the native Eskimo tribes inhabiting the same region, at least in matter of forethought, cleverness, and morality." It is found throughout most of the Arctic regions, and as far south as latitude 50°.

The three color varieties of the animal are so distinct that the mistake has not infrequently been made of regarding them as different species. In the Pribilof Islands, and the Aleutian Archipelago, it has the dull blue tint all the year round; farther north, it is bluish brown in summer and white in winter; still farther north, it is always pure white. Its nose is black-tipped and somewhat of the "stub" variety, and its ears have a cropped appearance, being shorter and more rounded than those of any other Fox. Its eye, which is hazel in color, is very bright and intelligent.



ARCTIC FOX

Three color variations of the same animal. In summer it is slate brown; in fall it is of mottled appearance; and in winter it is pure white

Arctic Foxes, like Prairie Dogs, live in communities, digging for themselves burrows, of which twenty or thirty are usually to be found together. They are fully as provident as Squirrels in storing up food for the winter, relying mainly upon lemmings. These the Arctic Foxes catch in the swamps or dig out of their holes. This Fox "hunts diligently while game is yet abundant, and brings home load after load of fat-bodied lemmings to be packed away in cold storage for the winter. Where the Blue Fox lives the frost never wholly leaves the ground; so he digs down in the moist turf until he reaches a temperature only just above freezing, and packs down several dozen lemmings in a place, covering them with moss and sods. These caches of frozen lemmings are his principal food supply for the greater part of the year." It will happen sometimes that these caches are opened by the Wolverines and Wolves, which are the worst enemies of the Arctic Fox.

During the short summer the Arctic Fox has a great variety of food and plenty of it. He is a terror to the different kinds of birds, especially breeding waterfowl, not only preying on the birds themselves, but also robbing their nests. He is partial to polar hares also, but catching these is no easy matter. When the first young seals are born, numbers of Arctic Foxes move seaward and find their food on the coastal ice.

According to Richardson, the Foxes of the northern portion of Arctic America migrate southward, the line of march being always as near as possible to the coasts. Some hunters, however, affirm that it is only the young Foxes which have not "set up housekeeping" that go south; and that these kill their food as they go, returning when daylight lengthens and the sun reappears across the south, to rejoin the older Foxes.

The Blue pelts are by far the more valuable, selling from $125 to $250. On St. George's Island, one of the Pribilof group, 250 pairs of Blue Foxes are kept for breeding purposes. Mr. James Judge, writing in *Science*, gives some interesting information concerning these Foxes. The mating season, he says, is March and the first half of April; and, contrary to the often heard statement that this Fox truly pairs, only one authenticated instance of pairing has been recorded on St. George's Island. The average weight of the males is a little under eleven pounds; that of the females, eight and three-quarter pounds. There are five to twelve cubs in a litter, and they are born in May or early in June. Occasionally there is a white cub in a litter. The cubs weigh about two and one-half ounces each, and their eyes open on the fifteenth day from birth. Only about two cubs per female reach maturity. Since 1896, all seal meat not used by the natives of the island has been salted and fed to the Foxes the following winter.

On various other islands along the Alaskan coasts some forty or fifty firms are engaged in Blue Fox breeding, and White Fox farming has become an important industry in Nova Scotia, New Brunswick and Quebec.

The Arctic Fox does well in captivity, and, according to Dr. Hornaday, is "ever ready to adopt the prepared food of civilization." It is a graceful and attractive little animal that repays closer acquaintance for its own sake as well as the value of its coat.

GRAY FOX

Urocyon cinereoargenteus (*Schreber*)

General Description.— The eastern Gray Fox is of medium size with moderately long hair and long bushy tail. Pupils of eyes elliptical; tail with concealed mane of stiff black hairs on its upper surface; skull with widely separate temporal crests; muzzle short. Color above silver gray, beneath white. Hair coarser than that of Red Fox.

Dental Formula.— Incisors, $\frac{3-3}{3-3}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{4-4}{4-4}$; Molars, $\frac{2-2}{3-3}=42$.

Pelage.— Adults: Sexes similar. General color of back and sides grayish-white; sides of neck and a band across the chest red-brown; ears, inner surface of legs, sides of belly and under surface of tail also more or less red-brown, the extent and intensity of the color variable. Throat and greater portion of belly whitish; sides of nose and under jaw blackish; a ridge of black hairs extend down middle of tail above. Young: Pups have muzzle blackish, head grayish; back of ears fulvous basally, tipped with dusky; tail black tipped.

Measurements.— Sexes nearly equal. Length, 35 inches; tail, 11½ inches; hind foot, 5¼ inches. Weight, 8 pounds.

Range.— New York and New Jersey to Georgia, west to the Mississippi Valley, and north to north central Illinois.

Food.— Mice, rabbits, squirrels, birds, eggs, reptiles, insects and various berries.

Remarks.— This animal is not to be confused through similarity of names with the Silver Gray Fox (*Vulpes fulva*) from which it differs considerably. Authorities have separated the Gray Foxes into no less than 14 species and subspecies to be found north of the Rio Grande. As the basis of many of these separations are with difficulty discernible to the layman no attempt is made to list all the related forms, only the principal ones being mentioned.

Related Species

Eastern Gray Fox.— *Urocyon cinereoargenteus cinereoargenteus* (Schreber). The animal described above. Eastern North America from Georgia north to New England, west to Mississippi Valley.

Florida Gray Fox.— *Urocyon cinereoargenteus floridanus* Rhoads. Size small; pelage harsher; tail and ears shorter. Florida to Georgia.

Scott's Gray Fox.— *Urocyon cinereoargenteus scotti* (Mearns). Longer ears and tail than the typical form; colors paler. Southern California, Arizona and western New Mexico.

Wisconsin Gray Fox.— *Urocyon cinereoargenteus ocythous* Bangs. Larger in size; tail longer; less gray, more yellowish. Upper Mississippi Valley.

Desert Gray Fox.— *Urocyon cinereoargenteus texensis* Mearns. Paler than the Eastern Gray Fox; ears longer; tail longer. Texas.

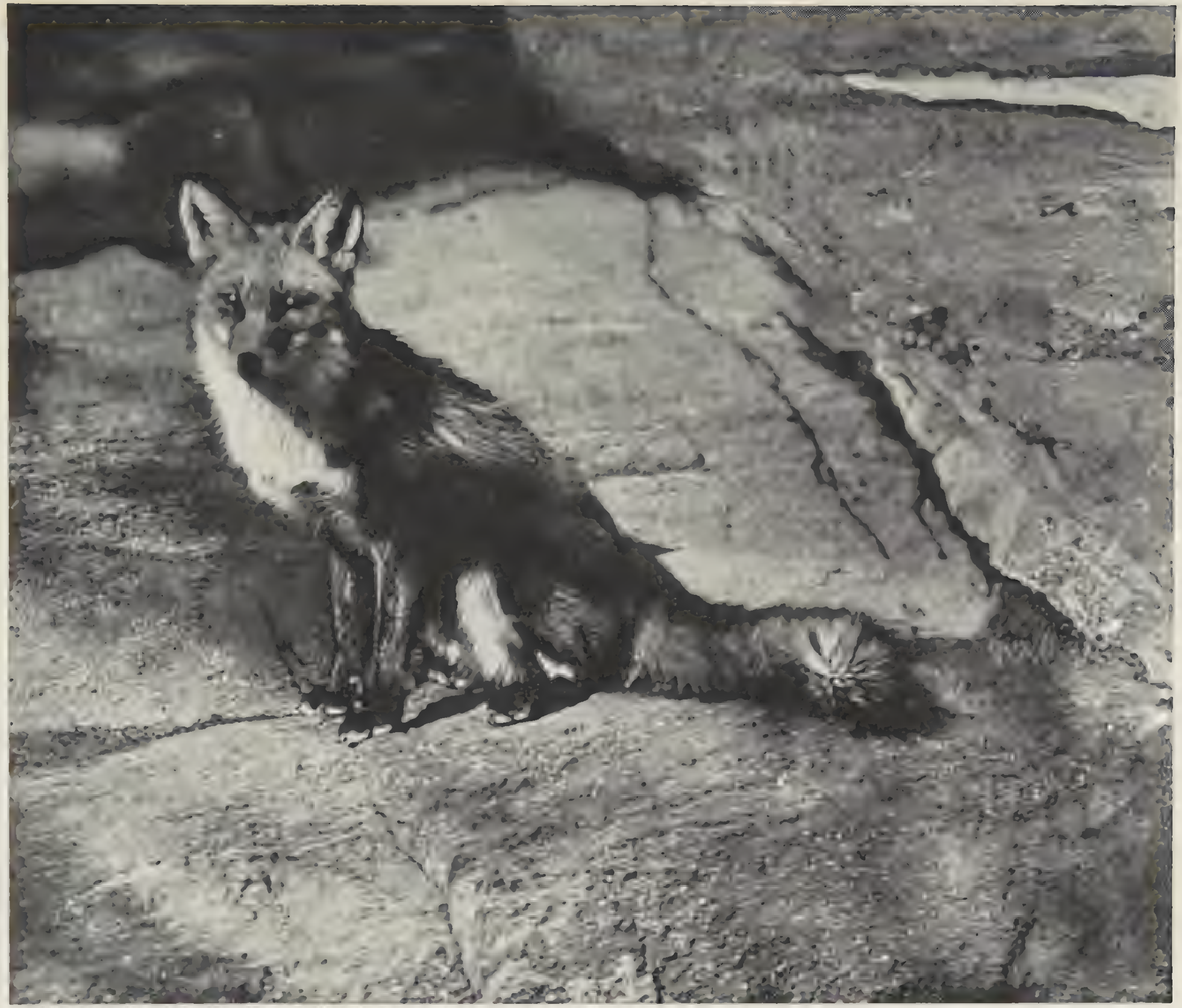
California Gray Fox.— *Urocyon californicus californicus* (Mearns). Paler, lacking black on fore legs. Ears much longer. California to Washington.

Santa Barbara Gray Fox.— *Urocyon littoralis littoralis* (Baird). Smallest of the Gray Foxes; weight about 4½ pounds. Color similar to California Gray Fox. San Miguel Island, Santa Barbara Islands, California.

The Gray Fox differs from its red cousin in color and size. It is not to be confused with the Silver Gray Fox, which is an animal of widely differing traits. Of the common Gray Fox there are at least fourteen species, the most important being listed above.

The male and female are nearly of the same size, being about three feet long, and with tails nearly a foot long.

The Gray Fox is common to almost every State of the Union, although in some sections persistent hunting or the growth of towns has



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EASTERN RED FOX

An animal common to the northeastern part of the United States, but with relatives scattered throughout the West made it scarce. The Eastern Gray Fox ranges naturally from New England to the Mississippi Valley. In Florida, there is a smaller cousin. In Wisconsin, a larger one, marked with more yellow. In California, there are several species. It will thus be seen how much at home Gray Jacket has made himself.

Dr. Ellzey, when contrasting the habits of the Gray Fox with the Red, observes that the two animals differ very widely. "So far as my personal observations inform me," he says, "the following are some of the principal distinctions. First, as to reproduction, the Red Fox nearly always brings forth its young in an earth den, the Gray Fox generally in a hollow log or tree or, at most, under a rock. I have seldom seen a Gray with more than five, and often with only four young. I have never seen a Red with less than five. I have seen one with nine, and several with seven. I think it certain, therefore, that the Reds are more prolific. Second, as to hunting for prey and subsistence. The Reds are bolder in pursuit, and hunt over a much greater territory than the Grays. Whether the Grays ever climb trees in pursuit of prey I am uncertain, but they take to a tree as readily as a cat when run hard by hounds. I think it nearly certain that they climb for persimmons and grapes. Red Foxes never climb trees under any circumstances; when hard run they go to the earth. Gray Foxes run before hounds only a short distance, doubling constantly and for a short time, when they either hole in a tree, or climb one. I have known the Red Fox to run straight away nearly twenty miles. Very commonly they run eight or ten miles away, and then run back in a parallel course. I have known them to run the four sides of a quadrilateral nine or ten miles long by about two miles broad. It is doubtful whether a first-rate specimen of the Red Fox, taken at his best in point of condition, can either be killed or run to earth by any pack of hounds living, such are his matchless speed and endurance. It is but a sorry pack which fails to kill or tree a Gray Fox in an hour's run. The young of the Gray Fox closely resemble small blackish puppies; those of the Red Fox are distinctly vulpine in physiognomy when only a few hours old."

Photograph by Daniel J. Singer

DESERT GRAY FOX

A desert-loving animal which frequently makes its home in a rocky den

"The Fox from its occasional misdeeds," says Dr. A. K. Fisher, "is looked upon by the majority of mankind as a deep-dyed villain that devotes its entire life to robbery and derives its forage from the chicken yard or duck pen. As a matter of fact, within the localities where Foxes are abundant, it is comparatively rare that poultry is destroyed by them. On all well regulated farms, chickens are housed at night, and the Fox necessarily turns his attention to field mice, rabbits, ground squirrels, and insects, such as grasshoppers, crickets, and May beetles to the great benefit of the farmer. Although it is true that the Fox destroys a considerable number of birds, yet a Ruffed Grouse has been known to rear its young within 100 feet of a Fox den, and the tracks of the young birds have repeatedly been seen on the fresh earth before the entrance. Among the food brought to the young in its litter and left outside were rabbits, mice and other smaller rodents, and half-grown woodchuck, but no birds of any kind."

EASTERN GRAY FOX

This animal is sometimes called the "tree fox" because he does not hesitate to climb trees, either to escape pursuit, or to hunt food — perhaps a nice young squirrel, or fruit or nuts. He is not hard to please

STRANGE COMPANY

Two Polar Bears and a Brown Bear fraternizing together in a menagerie

THE BEAR FAMILY

(*Ursidæ*)

BEARS comprise one of the most distinctly marked families of all the Carnivores. No one familiar with animals could see a Bear even at a distance and fail to recognize it. While the Bears may differ widely in size and coloring in various countries, the same general traits are peculiar to all. They are heavy lumbering animals, treading solidly upon their feet. In some species they grow to immense size, some of the largest being found in North America. They are, indeed, the largest of our Carnivores.

The skull of the Bear is heavy and elongated, the back portion being especially heavy, and the jaws powerfully hinged. The teeth are true molars with broad flat crowns. The soles of the feet are naked, the feet are plantigrade, and the tail short.

The members of the Bear family are characterized by their heavy and massive build, their thick limbs, extremely short tails, and the presence of five toes armed with powerful claws, on both the fore and hind feet. Moreover, when walking, the whole sole of the foot is applied to the ground in the heavy plantigrade manner, so that the impression of a bear's foot presents a considerable superficial resemblance to that of a man. The claws of the feet are incapable of being retracted, and are well adapted for digging, although no members of the family are in the habit of constructing burrows for themselves after the manner of foxes.

The various members of the family have a marked resemblance to one another, so that the characters by which the different species are distinguished are slight. Their fur is coarse, and generally long, thick, and shaggy, although it may be short and thin in some of the tropical species. Except for an occasional white collar round the throat, the fur is nearly always of one color, and generally some shade of either brown or black. It is true, indeed, that the Polar Bear is a marked exception to this rule, but in this case the color of the fur has evidently been specially modified to suit the natural surroundings. The great prevalence of black among the Bears is a feature unknown in any other group of Carnivores, and is, indeed, rare among Mammals in general.

Bears have a wide geographical distribution, occurring throughout Europe, Asia, and North America, while one species inhabits the South American Andes, and another the African Atlas. South, however, of the Atlas not a single member of the family is to be found throughout the length and breadth of Africa. Geologically speaking, true Bears, that is to say those which can be referred to the genera now living, are of comparatively recent origin, none being yet known before the Pliocene, while it is not till the succeeding period that they become abundant.

POLAR BEAR

Thalarctos maritimus *Knottnerus-Meyer*

Other Name.—White Bear.

General Description.— One of the largest of Bears, reaching a length of 10 to 11 feet. Color whitish to yellowish white. Neck elongate. Soles of feet hairy with small bald pads. Forehead nearly on line with nose. Head long. Molar teeth small and narrow. Tail very short.

Dental Formula.— Incisors, $\frac{3-3}{3-3}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{4-4}{4-4}$; Molars, $\frac{2-2}{3-3}=42$.

Pelage.— Sexes similar; young like adults. Color white at all seasons; sometimes portions of the pelage tinged with yellow or saffron. Hair long, soft and very dense, especially in winter.

Measurements.— Length, male, 8½ to 11 feet; height at shoulder, 4½ feet; weight, 1000 to 1500 pounds, but latter figure seldom attained. Female generally smaller.

Range.— Arctic regions of the world.

Food.— Seals, fish and any animal food it may catch.

Remarks.— This Bear may be known at once by its unique color as well as its long neck and body. The form described above is the typical animal of the Arctic regions, and by some authorities it is considered that there is only one Polar Bear in all the Arctic regions. By others the American Polar Bear is considered a distinct animal, and, in fact, no less than three different forms have been described from America. All of these, however, differ in no marked characters from the above, but for the sake of completeness they are listed below.

Related Species

Ungava Polar Bear.— *Thalarctos maritimus ungavensis* Knottnerus-Meyer. Typical animal of above description. Ungava, Canada.

Greenland Polar Bear.— *Thalarctos eogroenlandicus* Knottnerus-Meyer. Greenland.

Labrador Polar Bear.— *Thalarctos labradorensis* Knottnerus-Meyer. Labrador.

The Polar Bear, whether wild or in captivity, is one of the most interesting members of the Bear family. In its native state an inhabitant of the vast solitudes of the Far North, hunting its prey over snowfields and glaciers or in icy waters, it nevertheless bears confinement well, and has become a familiar object in our zoological collections, of which it always proves an attractive feature. Usually regarded as scarce in comparison with other species of Bear, the Polar Bear is probably more numerous than is generally supposed. On a lone island in the northern part of Bering Sea there were found in the latter part of the last century between 250 and 300 Polar Bears, twenty being in view at one time; and it is reasonable to conclude that in the immense inaccessible regions of the Arctic, where the animal can breed unmolested, there must be large numbers that pass their existence unknown to and undisturbed by their chief — one might say, their only enemy — man.

By permission of the New York Zoological Society

POLAR BEARS

Two half-grown cubs trying to keep cool in the Zoological Park, New York. Their coats, if frequently washed, are almost pure white

The Polar Bear is equally at home on land or in water. Its hair-covered soles enable it to retain a firm footing on the most slippery surfaces; and it has been seen to watch from a projecting piece of ice an unsuspecting seal sunning itself on a ledge below, then suddenly to shoot on to the head of its victim, knocking the latter into the water, where it became an easy prey. It is far and away the most powerful swimmer of the bear family. It has been met with in the open sea forty miles from the nearest shore, and Peary saw the tracks of one along the course of a lead covered with young ice, more than 200 miles from land.

Another remarkable fact recently discovered is that the Polar Bear swims entirely with its forelegs, the hindpart of its body being well down in the water. It is possibly the only quadruped which swims in this fashion.

Like all Bears, the Polar Bear has poor eyesight, and relies mainly on its nose for scouting. Its sense of smell is very keen, and it can readily detect the presence of concealed food on land and of fish in a harbor. It is very fond of pork, especially fat pork; and Felix Riesenberg, who had a hunting camp on the shores of Virgo Haven, opposite the old Andree base, thus relates how the odor of roast ham once brought an inquisitive Bruin to his death:

"Morton, who was the official chef, busied himself in an attempt to roast some pieces of ham over the glowing coals, while Paul and I sat impatiently by, awaiting the completion of the dainty morsels and ready to sandwich them between pieces of hardtack. On the stove we had a pot of coffee steaming merrily. At the conclusion of this modest refreshment we proposed to crawl into our bags.

"The noise of sharp claws against a roof of frozen tar-paper is peculiar, and the thud of a heavy body launched from nowhere and scratching its way over your lonely housetop away up in the Arctic regions is, to say the least, diverting. These sounds rasped upon us just as we were about to draw our toes up to the fire for a smoke, and the thrill sent through our little party was electric. 'A Bear! A Bear!' we all shouted together, grabbing our rifles and rushing blindly out into the night. . . . I sent two shots after a big white fellow in full retreat over the snow.

"The bear had carefully nosed his way up on top of the slanting roof of the lean-to, and on up to the smoking chimney whence came the appetizing odor of roast ham. Evidently a whiff of smoke had caused him to lose his balance, and he slid backward, scratching with all his might to hold his footing.

"Roast ham proving a tempting bait for Bear, we kept our surplus pork trimming sizzling in the stove for many days."

POLAR BEAR AT HOME

The floating ice that forms this Polar Bear's couch is just to his liking

At length the Bear came back, and this time received his quietus from the rifles of the party.

The flesh of the Polar Bear is welcome food for the hunter; its teeth and claws are used as ornaments; its fat furnishes the Bear's grease of commerce; and its pelt serves as material for garments for the Eskimos and is mounted in the form of robes and rugs. A fine specimen of the latter has been known to fetch $1,000 in New York.

Both Carl Hagenbeck and J. W. Bostock, the well-known animal trainers, agree that the Polar Bear is harder to train than any other kind of Bear. The former says that "at certain seasons of the year they become extraordinarily restless and intractable," and the latter, that "even in cold and frosty weather, a Polar Bear, when being trained, will get completely played out long before any ordinary Bear would consider he had begun."

J. Alden Loring, who studied the antics of two Polar Bears which for ten years were exhibited in the New York Zoological Park, bears testimony to the genuinely playful disposition of the animals. They would amuse themselves for hours with an airtight beer-keg, which they would force under the water in their swimming-tank when it came to the surface, much as a child would keep a rubber ball bouncing on the sidewalk; they engaged in bona-fide wrestling bouts; and one was a very good juggler with a piece of bone, which he would throw up into the air with evident enjoyment.

Most of the Polar Bears now shown in the menageries and zoological parks were captured when young, but a few years ago Paul J. Rainey succeeded in bringing from the Arctic a full-grown male. This was such a difficult, hazardous, and noteworthy undertaking that some account of it may well be given place here. The first Bear captured, being noosed round the neck, was strangled in being hauled to the deck of the ship. Of the second and successful capture, Mr. Rainey writes in the *New York Zoological Society's Bulletin:*

"On Thursday, August 4th, we sighted a large Bear that the Eskimos took to be a female, but which proved to be the large male Bear now in the New York Zoological Park, swimming among the small broken pans. We lowered the launch and started after him. . . . Finally we succeeded in cutting him off by running between him and the pan for which he was making. . . . He dove, came up alongside, and smashed the boat a terrible blow.

"The Bear seemed to have an idea of getting into the launch, and we had to punch him away with the boathook. Finally we succeeded in roping him, and this time I took good care to leave the rope slack until he had put his forelegs through it, when I took a turn with our end of the rope just as the Bear was busy climbing out on the ice. . . . It was a wonderful sight to see this enormous brute with a strong rope just behind his fore shoulders. He would rear on his hind legs, bite at the rope, and jump up and down; but . . . we steadily and surely dragged him towards the edge. Finally, seeing that the inevitable was coming, with a vicious growl, he plunged into the water. . . . We towed him to the ship, swung out the crane, fastened the hook on to the rope, and in the twinkling of an eye Mr. Green, the mate, had hoisted him high into the air and swung him over the ship's deck."

Photograph by J. W. McLellan

AN ANGRY POLAR BEAR

The Polar Bear is not the heavy, inactive animal that he appears to be. He can swim and dive nearly as well as the seal, and climbs icebergs rapidly

After several attempts to demolish the cage in which he had been placed, in consequence of which a sailor was set to watch the Bear day and night, the animal reached City Island, where he was unloaded by men from the neighboring Zoological Park.

When the first voyagers went to the Arctic Seas, dressed in thick clothes and skins, the Polar Bears took them for seals. On Bear Island, below Spitzbergen, a Dutch sailor sat down on the snow to rest. A Bear walked up behind him, and seized and crushed his head, evidently not in the least aware of what kind of animal it had stalked. When the Jackson-Harmsworth Exposition was wintering in Franz-Josef Land, the Bears were a positive nuisance. They were not afraid of man, and used to come round the huts at all hours. The men shot so many of them that they formed a valuable article of food for the dogs.

The power of these Bears in the water is wonderful; though so bulky, they are as light as a cork when swimming, and their strong, broad feet are first-class paddles. The manoeuvres of a Polar Bear in the water are marvelous to watch. It swims, dives, rolls over and over, catches seals or fish, or plays both on and under the water with an ease and evident enjoyment which show that it is in its element. A favorite game is to lie on its back in the water, and then to catch hold of its hind toes with its fore feet, when it resembles a half-rolled hedgehog of gigantic size. It then rolls over and over in the water like a revolving cask. Its footsteps are absolutely noiseless, as the claws are shorter than the land-bear's, and more muffled in fur. This noiseless power of approach is very necessary when it has to catch such wary creatures as basking seals. A very large proportion of the food formerly eaten by Ice Bears in summer was probably putrid, as they were always supplied with a quantity of the refuse carcasses of whales and seals left by the whaling-ships. This may account for the bad results to the sailors who ate the Bears' flesh. Now the whaling industry is so little pursued that the Bears have to catch their dinners for themselves, and eat fresh food.

The Arctic explorer Nordenskjold saw much of these bears on his voyage, and left us what is perhaps the best description of their attempts to stalk men, mistaking them for other animals. "When the Polar Bear observes a man," he writes in his "Voyage of the Vega," "he commonly approaches him as a possible prey, with supple movements and a hundred zigzag bends, in order to conceal the direction he means to take and to prevent the man feeling frightened. During his approach he often climbs up on to blocks of ice, or raises himself on his hind legs, in order to get a more extensive view. If he thinks he has to do with a seal, he creeps or trails himself forward on the ice, and is then said to conceal with his fore paws the only part of his body that contrasts with the snow — his large, black nose. If the man keeps quite still, the Bear comes in this way so near that it can be shot at the distance of two gun-lengths, or killed with a lance, which the hunter considers safer." When hunting seals, Polar Bears will chase them in the water as an Otter does a fish, but with what result is not known. Besides stalking them in the manner described above, they will mark the place at which seals are basking on the rim of an ice-floe, and then dive, and come up just at the spot where the seal would naturally drop into the water.

GRIZZLY BEAR

Ursus horribilis *Ord*

Other Name.— Silver-tip Bear.

General Description.— Among the largest of the Bears, powerfully built, heavy, thick set. Five well developed toes on each foot; plantigrade; claws long, nearly straight, nonretractile; claws on front foot longer than those on hind foot; tail very short; ears short, rounded; color everywhere dark; generally of a deep brown color grizzled or frosted with white tipping to the hairs.

Dental Formula.— Incisors, $\frac{3-3}{3-3}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{4-4}{4-4}$; Molars, $\frac{2-2}{3-3}=42$.

Pelage.— Sexes alike in color with little seasonal variation. In general color deep brown darkening to brownish-black along spine, on limbs and on ears; occasionally white tipping much reduced; limbs dark, sometimes whitish areas on face or chest. Hair everywhere rather long; generally a short mane on shoulders and upper back, and hair at base of jaws somewhat elongated. YOUNG: Dark in color, similar to adults.

Measurements.— Length, male, 8 to 9 feet; height at shoulder, 3½ to 4 feet; hind foot, 10 inches; claws, 4 to 6 inches. Weight, 600 to 800 pounds. Female, slightly smaller, weighing 500 pounds.

Range.— Wyoming to Alaska in Rocky Mountain region.

Food.—More or less omnivorous, but at times largely carnivorous when opportunity affords; able to prey on the largest, but not disdaining to eat small mammals, such as ground squirrels and gophers.

Remarks.— The Grizzly Bears comprise several species, and they in turn are related rather closely to the group of Bears known as the Big Brown Bear of northern distribution. The line between these groups is not a very hard and fast one, and the classification of the large Bears has been so shrouded in confusion that no two authorities are agreed as to their exact status. In general the grizzlies may be said to inhabit the country from Mexico through the mountain ranges to Alaska, where their habitat overlaps that of the Big Brown Bears. The principal variations in the grizzly group are size and slight color differences, while some importance attaches to cranial marks.

RELATED SPECIES

Silver-tip Grizzly.—*Ursus horribilis horribilis* Ord. Typical form described above. Wyoming to Alaska.

Sonora Grizzly.— *Ursus horribilis horriaeus* Baird. Main differences to be found in the skull. Mountains of New Mexico, Arizona, Colorado, Utah.

California Grizzly.— *Ursus horribilis californicus* Merriam. Largest of the *horribilis* group, and with little silver tipping to the hairs. California.

Alaska Grizzly.— *Ursus horribilis alascensis* Merriam. Size very large. Found in the Norton Sound region, Alaska.

The Grizzly Bear occupies a unique position in the history of the fauna of the North American Continent. From the times when the Indians (never in less than parties of six or eight) attacked it with bows and arrows, down to the present era of the breechloader and magazine rifle, it has stood, in public estimation, as the embodiment of all that is ferocious and terrible among big game animals.

The Grizzly has certainly been more misrepresented than any other member of the Bear family. He has been discredited with the practice of hugging his victim to death; he has been accused of feasting upon mules; and one *quasi*

Photograph by J. M. Johnson

GRIZZLY BEAR

Calmly surveying the intruder of its home, in Yellowstone Park authority states: "He will climb a fruit-tree, strip whole branches of ripe fruit with his huge paws and claws, and then on the way home will finish off the meal with a toad or a lizard." Mr. William H. Wright cites a State Senator who "tells of shooting a Grizzly four times through the heart and having it still chase him over down timber and bad going," and of another "that used to come once a week, climb a live-oak tree, walk out along a horizontal branch over a high-fenced pigpen, drop in, steal a little pig, push the gate open (it opened out), and go home." Dr. Hornaday, who has made many observations on the temper of the Grizzly, is "convinced that naturally the disposition of this reputedly savage creature is rather peaceful and good-natured. At the same time, however, no animal is more prompt to resent an affront or injury, or punish an offender. The Grizzly temper is defensive, not aggressive; and, unless the animal is cornered, or *thinks he is cornered,* he always flees from man."

Less than a quarter of a century ago, the range of the Grizzly Bear was given by naturalists as from Norton Sound, Alaska, through the Rocky Mountains to Mexico, and from the Pacific Coast across the Sierra Nevada to Wyoming; but this is now considerably diminished, and as late as 1903, it was stated that "in all parts of the United States save the Yellowstone Park and the Clearwater Mountains of Idaho, the Grizzly is now a rare animal, and so difficult to find that it is almost useless to seek it this side of British Columbia . . . in a short time none will exist in the United States outside of the Yellowstone Park and the zoological gardens. In the wilds of Alaska, they may survive for perhaps a quarter of a century longer."

Compared with the Black Bear, the Grizzly has a greater length of body, and is straighter along the back. The muzzle is rather square, the jaws are longer, and the forehead narrower. Another characteristic of the Grizzly is the great length of the third incisor on each side of the upper jaw. Dr. W. S. Rainsford once killed "two well-grown two-year-old Grizzlies together, who had double instead of single tusks, in both upper and lower jaws." It has very powerful shoulders, and over these in some members of the group is a hump-like lift which hunters term the "roach." Its claws are from four to six inches long and very formidable; and, while they do not enable the animal to climb a tree, they are admirably adapted for digging roots, turning over rocks or logs, and especially for fighting. A Grizzly has been known to carry off the carcass of an Elk weighing nearly 1000 pounds.

The published accounts of the size and weight of the Grizzly Bear are, in many cases, very misleading and much exaggerated. Mr. Wright, who has hunted, studied, or photographed the animal for twenty-five years, has seen old Grizzlies, with "their teeth worn down to the gums," that would not have tipped the scales at more than 250 or 300 pounds. Dr. Rainsford estimated the largest of eighteen Grizzlies killed by him at not more than 850 pounds. Mr. Wright saw one in Spokane that had been "sold to a butcher, who claimed that he weighed it and paid for 1173 pounds of bear meat."

With regard to color, Grizzlies show considerable variety. As long ago as 1805, Lewis and Clark in their journals described them as "grizzly," "gray," "white," "brown," and "variegated." Dr. Rainsford considers that all varieties of color are accounted for by the established fact of interbreeding; he himself "shot three young Bears going with one sow, one almost yellow, one almost black, and another nearly gray." Dr. Hornaday does not "know of any other Bear species in which the coloration of the pelage is so erratic." The standard color (in winter) is brown next to the skin, the extremities of the hair being tipped with silvery gray, from which has come the common name of "Silver-tip."

It is difficult to describe the gait of a Grizzly. His walk is a shuffle but he will go a very long way without breaking it; his run is a mixture of a lope and a gallop; and "no man can match him in speed, and it takes a mighty good horse to catch him."

The feeding habits of the Grizzly Bear depend on his environment. In a good Elk country he will feed on the carcass of that animal; in the Clearwater region he forsakes this diet, and subsists on grass, salmon — he is a skillful fisherman — and ants, grubs, or larvæ. When the berries come round, he feeds on them; later, on salmon again, and once more on ants.

Grizzly Bears mate in the Northwest about the middle of June to August, and begin to hibernate in November, but these times vary somewhat in different regions. The cubs (generally two or three, but sometimes four) are born in the winter den of the female; and are tiny things for such huge parents. Two born in the Zoological Park, New York, weighed eight ounces each, and measured nine inches from nose to tail. The dam and cubs leave their den from one to three weeks after the male has left his winter quarters. A curious and unexplained habit of some Grizzlies at this time is that of scoring trees with their teeth; sometimes they will bite out considerable pieces from the trunks.

Of the nature and disposition of the Grizzly Bear something has been said above. In estimating the conflicting accounts that have been printed, it is obvious that the experience and opinions of those who have hunted the animal and studied it at close range are most to be relied upon. Dr. Rainsford considers that the increase in the power of the rifle, and "the pressure of civilization felt more and more in the wildest parts of the land" have brought about a change in the habits of the Grizzly, and that "the danger of his attack, in the present day, has been grossly exaggerated." He accounts for many of the stories of "charging" Grizzlies by the fact that "when fired at, whether wounded or not, he will almost invariably turn downhill and try to get away, and in doing so, often nearly tumbles over his antagonist, who fancies the Bear is charging at him, when his sole intention is to get away as soon as possible." Mr. Wright has "never known of a single instance where one of these Bears turned out of his way, unprovoked, to attack a human being."

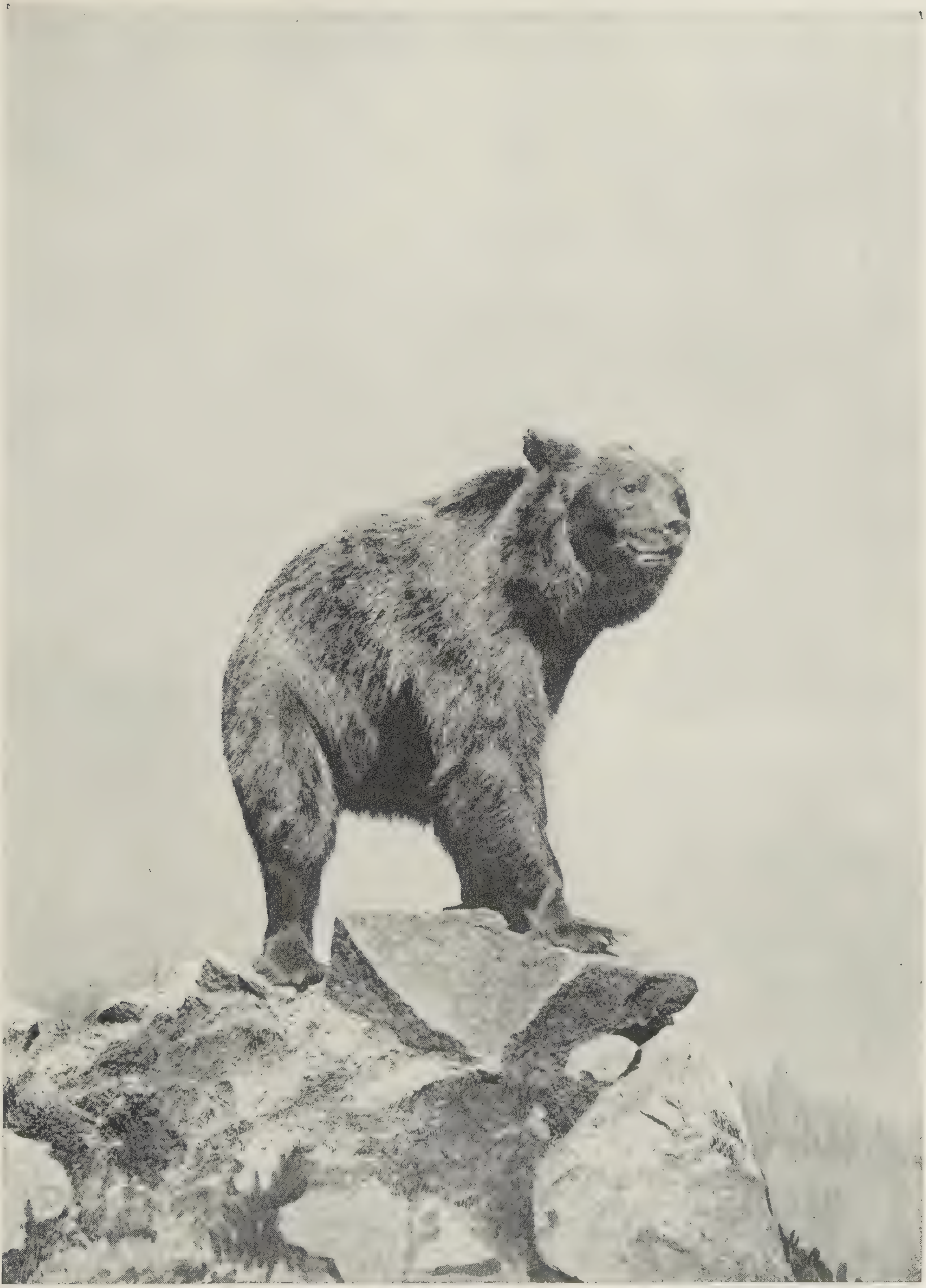
Photograph by C. J. Hawkins

BLACK BEAR CUB

Out on a foraging expedition

In captivity, the Grizzly Bear responds to fair treatment better than any other well-armed animal does; it generally reaches full maturity between the ages of six and seven years. In 1909, in the Cenetral Park Menagerie, New York, a Grizzly was chloroformed which was more than twenty-five years old. That the Grizzly can be tamed, if taken young, has been abundantly proved. James Capen Adams ("Grizzly Adams") had two which he had reared from cubhood, "Lady Washington" and "Ben Franklin," the former of which used to carry his blankets, etc., and sleep near him, and the other saved his master's life when attacked by a wild Grizzly.

Early settlers have testified that this Bear often caches its food. On a ranch near the upper waters of the Colorado River, several years ago, some colts were seized by Grizzly Bears. One of them was found buried according to the custom of this Bear, and the owner sat up to shoot the animal. Having only the old-fashioned small-bored rifle of the day, excellent for shooting Deer, but useless against so massive a beast as this Bear, unless hit in the head or heart, he only wounded it. The Bear rushed in, struck him a blow of its paw, smashed the rifle which he held up as a protection, and struck the barrel on to his head. The man fell insensible, when the Bear, having satisfied himself that he was dead, picked him up, carried him off, and buried him in another hole which it scratched near the dead colt. It then dug up the colt and ate part of it, and went off. Some time later the man came to his senses, and awoke to find himself "dead and buried." As the earth was only roughly thrown over him, he scrambled out, and saw close by the half-eaten remains of the colt. Thinking that it might be about the bear's dinner time, and remembering that he was probably in the larder for the next meal, he decided that he had an urgent engagement elsewhere.



BROWN BEAR

While a beast of enormous size, Bears are by no means so ferocious as often painted. This is a Siberian cousin which prefers the solitary wastes where it may hunt undisturbed

ALASKA BROWN BEAR

Ursus middendorffi *Merriam*

Other Names.— Kodiak, or Kadiak Bear.

General Description.— General appearance about as in Grizzly Bear. See general description of Grizzly Bear. Largest of American carnivores and probably largest in the world. General color golden-brown. Shoulders high, head broad, forehead massive, nose flat, short, square; drop in the line of the head directly in front of eyes.

Dental Formula.— Same as that of Grizzly Bear.

Pelage.— Sexes similar and seasonal variation rather slight. Color uniform brown or golden with same color on the legs. Coat long, thick and shaggy.

Measurements.— Length, 9 to 10 feet; height at shoulders, 45 to 50 inches. Weight, 1200 to 1600 pounds.

Range.— Kodiak Island and adjacent mainland of Alaska.

Food.— Principally salmon and vegetation.

Remarks.— The Kodiak Bear is regarded as a representative of the group of Big Brown Bears ranging throughout northwestern Arctic America. This group is differentiated from the Grizzly Bears farther south, to whom they are very closely related, mainly by the lighter brown coloration of the pelage, higher shoulders, wider head and shorter claws. The Kodiak Bear is probably the largest of the group but they are all large animals. Some six or eight species of this group have been described.

Related Species

Kodiak Bear.—*Ursus middendorffi* Merriam. Typical animal as described above. Kodiak Island and adjacent mainland of Alaska.

Yakutat Bear.—*Ursus dalli dalli* Merriam. Size large; skull flattened in frontal region as contrasted with highly arched frontals of *middendorffi*. Yakutat Bay region, Alaska.

Peninsular Brown Bear.—*Ursus dalli gyas* Merriam. Larger than *dalli*, about same size as Kodiak Bear. Region about Pavlof Bay, Alaska.

Merriam's Brown Bear.—*Ursus merriami* Allen. Allied to Yakutat Bear but differing in cranial characters. Region about Portage Bay, Alaska.

Kidder's Brown Bear.— *Ursus kidderi* Merriam. Decidedly smaller than Kodiak Bear, color much like that of Peninsular Bear. Cook Inlet region, Alaska.

Sitka Brown Bear.—*Ursus sitkensis* Merriam. Smaller than *dalli* and teeth of distinct type. Region about Sitka, Alaska.

The Alaska Brown Bear enjoys the distinction of being the largest flesh-eating animal in America, and probably in the world. Its huge bulk, powerful limbs, and beautiful coat of golden-brown unite to give it an imposing appearance. It stands very high at the shoulders, compared with its length, while its broad head, heavy forehead, and small gleaming eyes have given it a reputation for ferocity which many accounts belie.

The habitat of this interesting Bear extends along the coast of southeastern Alaska and most of the large islands adjacent thereto. Kodiak Island and the Alaskan Peninsula seem especially adapted to their liking. Here they roam over this immense rugged country, seldom molested by man and certainly not by any other enemy.

Alaskan Bears hibernate during the long Alaskan winters, and their hibernating dens are generally in the most rugged mountains, where, even in summer, there is no vegetation. The cubs, usually two in number, are little round balls of fur, so small that a man could easily hold one in the hollow of his hand. In Alaska, it is daylight from June to September; and when the bears come down to the lowlands they usually settle themselves in a brushy, well-watered valley. Here the cubs will play for hours at a time in the long sunshine, the mother Bear watching them or dozing in the dry grass. In their first lessons in living off the country, the cubs begin with ptarmigan chicks and field mice. Later the mother Bear instructs them in catching marmots and ground squirrels. As the summer passes, the hungry beasts make their way to the salmon rivers as the fish are coming up from the sea to spawn. They generally fish in shallows above a deep pool. Stationing themselves where there is hardly sufficient water to cover the pebbles, they will patiently wait for the fish to come within their reach, when they will throw the salmon out upon the bank with their paws and feast to their heart's content. When the salmon have gone, the Bears betake themselves to the heights above the timber line, where they may be seen " like grazing oxen rolling across the hills." They are now taking on fat for their long winter's sleep, and their fur grows long and silky.

The New York Zoological Park possesses one of the largest Alaskan Bears in captivity — known as Ivan. He was taken at the head of a canyon looking down on Bering Sea. The mother had been killed, and the cub, which was standing by the body, was driven into a glacial stream. His captor says: " He was helpless in the swift water, and I caught him behind his furry ears, and as I carried him dripping and kicking to the bank, the mountains re-echoed to his grievances. We used our heavy woolen socks to muzzle his mouth and paws, and then, rolling him up in a pack strap, I swung him onto my back. . . . We fed the cub on raw sea-gulls' eggs, and he thrived on the diet."

Alaska Bears prefer to stay near the coast, as their natural food is found in the vicinity of salt water. Their chief diet consists of salmon, of which they consume large quantities, as the fish swarm up the small rivers and shallow streams.

The run of the various kinds of salmon lasts from June to October. During this period the Bears fatten up and upon this fat they live through their long winter sleep. They den up for the winter some time in November, depending upon the latitude and the severity of the weather.

Most Bears remain in their den until April before emerging, but occasionally, for one reason or another, they will roam abroad even in midwinter. Possibly their quarters become uncomfortable and they are compelled to look up another den.

Usually they select their dens well up on the rough and broken mountain sides, where the rocks form a natural cave, and it is probable that the same winter quarters are used year after year. The male Bear is the first to come out in the spring. On emerging he partakes very sparingly of food and only nips the tender tops of green grasses, and in fresh water localities of skunk cabbage, until he becomes used to eating and digesting food again.

He now turns his attention to the salmon berry and roots. By this time he is feeling quite himself again, and now begins to wander far and wide for the track of a female. After finding a mate he follows her persistently and it is at this time the mating season begins. This period lasts generally from the first of May till July.

The cubs are born in the winter den of their mother, usually about the first of the year, or in February. They are very tiny, compared to the size of their mother, and would weigh sometimes near a pound and a half. There are from one to four in a litter, two I think, more often occurring. Their eyes are not open and they are quite helpless for the first few weeks.

The cubs follow their mother, and den with her the first fall, and it is not until the second fall that they shift for themselves. They grow to enormous size, just how large no one can accurately state. There is one mounted in the American Museum of Natural History that weighed, when alive, 1600 pounds. It stood four feet four inches at the shoulders and measured eight feet in length. Dr. Hornaday once showed me an unstretched skin that measured nine feet, four inches.

When one considers that a big lion will not weigh more than 500 pounds, one will gain some idea of the huge bulk of this beast. The length of an animal's skin can only be fairly measured, and properly, by doing the measuring before it is removed from the animal. A skin stretched and measured means very little, as it is possible to stretch a skin into almost any shape or size.

The head of the Alaska Bear is very massive, and he stands high at the shoulder. This characteristic is emphasized by a thick tuft of hair which stands erect on the dorsal ridge above the shoulder.

The Bear's senses of smell and hearing are developed to an extreme degree. Its vision however, as in most of the Bear family, is not particularly good. The difficulty seems to be in discerning or separating objects that are inert: for instance, if a man remains perfectly still, he is not likely to be detected, unless scented or some movement is made.

The color of the pelage ranges from a creamy tan to a dark brown, and in some cases almost black.

In several sections the Alaskan Bears have been divided into subspecies under the following names: Those found on Kodiak Island are classed under the name of *Ursus middendorffi.* They have long noses and belong to the long-skulled group with the large and slightly curved claws. This species was first described by a man who bore the name of Middendorf, and in whose honor it was named. This same species is found also on the mainland, and I had the good fortune to shoot one at the head of Snug Harbor, which is on the west coast of Cook Inlet. Chinitna Bay is thirty miles south of Snug Harbor, and in both of these sections the *Ursus middendorffi* and another subspecies are found. The second is classified under the name of *Ursus kidderi,* and is generally of a lighter color on the body and darker on the legs, while the nose and skull are shorter than the Kodiak variety. The Bears from the Copper River districts are the short and thick-muzzled species, and take the name of *Ursus dalli.* The Admiralty Bear, *Ursus eulophus,* represents a large species found on Admiralty Island. Its color usually resembles that of the Kodiak Bear.

The Bears found well down on the Alaskan Peninsula, *Ursus gyas,* have a tendency to more of a brownish yellow color. Their claws are of great size and thickness. This species inhabits the open country — that is, for the most part devoid of timber. There are undoubtedly other sections where the Bears differ from the ones already described.

It is commonly believed that feigning death will prevent a Bear from inflicting further injuries, and I have heard of several cases where it is supposed to have saved men's lives. The supposition is that the Bear, believing his victim dead, goes on about his business. With beasts of prey this strategy must not be too much relied upon. In some cases it may prove effectual with Bears, as Bears do not as a rule eat human flesh. But with the Cat family I think it would prove ineffective. Probably the conventional expression, "the Bear hug" has no significance. Black Bears hug tree trunks in ascending trees adapted to their embrace, but the Brown Bear is too large and too heavy for that, and the claws are not adapted for climbing. In fact, like the greater *Felidæ,* they are not constructed for any arboreal gymnastics. There is no available evidence to show that this or any other Bear attempts to inflict injury by hugging an enemy with its arms.

There is great divergence of opinion as to the disposition of the Alaskan species, some saying that it will avoid man, others that it will not hesitate to go out of its way to make an attack. Mr. Edward G. W. Ferguson, who spent seven years in Alaska and familiarized himself with the country and its fauna, is convinced "that he is just naturally fearless and savage most of the time." He cites two cases where this Bear deliberately chose to attack men. In one of these a Swedish prospector was making his way to where he had left his pack. "His path was of necessity circuitous, and he was scrambling his way among the huge boulders, when suddenly he came face to face with a 'Silvertip' (the local name of the Kodiak). The Bear growled, dashed for him, mouth wide open, eyes ablaze. The Swede, panic-stricken, thrust his gun forward, and providentially into the Bear's open mouth, and well into his throat. The Bear closed his jaws over both barrels and crushed them; but before he did this the Swede, unintentionally without doubt, pulled both triggers and the charge shattered the Bear's spine. The carcass was brought to town . . . and measured six feet seven inches from nose to tip of the tail."

The other case was that of a rodman engaged in surveying, who was startled by seeing one of these Bears waddle out of the brush and make its way toward him. "The rodman backed away toward the water as fast as he could, but did not fire, realizing that his weapon, a shotgun, could only wound and anger, but could not possibly kill the beast. I grabbed my rifle and ran up the bar. The Bear did not even turn its head to look in my direction, and by the time I was within 100 feet of him the rodman had backed into the stream up to his waist, and the Bear was wading in after him. I yelled to him and he let go both barrels at once full into the brute's face. As we found out, the shot had blinded him in both eyes. While he was roaring and thrashing about, beating the water to a froth, I carefully emptied the magazine into him, coming closer at each shot."

This writer claims that the Bear "had no reason for deliberately coming out of the woods and chasing the rodman into the water" and that he can be relied upon to tackle a man whenever he comes across one.

Mr. Charles Sheldon, who hunted this Brown Bear on Montague Island in 1905, made this entry in the diary of his trip: "I had proceeded but a few steps when suddenly I saw about eight feet away, on the curving border of the spruces, running directly at me, what appeared to be a huge Bear. I had just time to push forward the butt of my rifle, and yell, when it collided with me, knocking me down. It seemed to turn slightly to the left as I pushed my rifle into it, and I clearly recall its shoulder striking my left hip, its head striking first above my left knee, while its claws struck my shin, so that it is now black and blue. I had the sensation of being mauled and mutilated. As I fell, to the right, my rifle dropped, and in my confusion, I grabbed with my left hand the animal's fur. . . . The Bear was, I believe, more surprised than I. I felt its fur slip through my hand, as it quickly turned to its right, and, swinging about, ran back over the hill without any attempt to bite or strike me."

DANIEL J. SINGER.

BARREN-GROUND BEAR

Ursus richardsoni *Swainson*

General Description.— See also general description of Grizzly Bear. Size large, muzzle short and slightly upturned, dentition of Grizzly Bear. Color yellowish-brown to very much lighter.

Dental Formula.— See that given for Grizzly Bear.

Pelage.— General color throughout yellowish-brown varying in individuals to yellowish so that animal has whitish appearance.

Measurements.— Length, 8 feet; tail, 3 inches; height at shoulder, 3 feet, 6 inches.

Range.— Barren Grounds between Hudson Bay and MacKenzie River; hilly regions east and north of Great Bear Lake; also Rockies west of MacKenzie possibly to the upper tributaries of the Yukon.

Food.— Small rodents, ground squirrels, mice, etc., and berries and grass.

Remarks.—This bear, while generally placed by authorities in the group of the Grizzly Bears, has, nevertheless, characters not found among the Grizzlies. Its range is in a region of heavy snowfall, a treeless region, and because of these facts it has developed habits differing from those of its northern relatives. It ranges throughout its northern habitat without becoming differentiated into more than the one species.

Little is known concerning the Barren-Ground Bear, because of the inaccessibility of its home. We know its general appearance, measurements, and color, but beyond that have not cultivated its acquaintance very extensively. It lives, as its name indicates, in a treeless waste of country in the far North, between Hudson Bay and the Mackenzie River; also to the east and north of Great Bear Lake. It is about the size of the Grizzly Bear, which it generally resembles, but it has a shorter muzzle and a yellower coat. Its fur, especially in winter, is remarkably thick.

The hibernating period is very long, often six months of the year, because of the relatively short summer; and when the animal emerges from its den, pinched by hunger, it is alert and frequently savage. The number of cubs born during the winter period is from two to four. They are extremely small at first, but rapidly develop as soon as they get out into the sunlight.

These Bears are both flesh-eaters and vegetarians. Any fish, flesh, or fruit in season is welcome. Their enemies are few, because of the desolate country they inhabit.

AMERICAN BLACK BEAR

Ursus americanus *Pallas*

General Description.—A medium-sized animal weighing 250 to 400 pounds and black in color. Form robust; legs short, powerful; claws long, sharp, somewhat curved; tail short; soles naked; plantigrade. Molar teeth are broad, flat crowned and lack high sharp cusps. Hair long and moderately soft. Ears erect, rounded.

Dental Formula.— Incisors, $\frac{3-3}{3-3}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{4-4}{4-4}$; Molars, $\frac{2-2}{3-3}=42$.

Pelage.— Notably of two phases in most regions, not infrequently the two phases being represented at a birth. These color variations are the black and the cinnamon. *Black Phase.* Adults and young similar; sexes identical. General color black, varying from brownish black to coal black, often with a white spot on breast; face tinged with cinnamon-brown or tan-brown. *Cinnamon Phase.* Everywhere cinnamon-brown, often with a lighter shade of brown on nose.

Measurements.— Sexes almost equal. Length, 6 feet, 5 inches; height at shoulder, 3 feet; tail, 5 inches; hind foot, 8 inches. Weight, 200 to 400 pounds.

Range.— Wooded North America except Louisiana and Florida, where other species occur.

Food.—Omnivorous; fruit, berries, grass; mice, squirrels, and any other mammal it can catch; birds and eggs; fish and frogs; ants and their larvae; honey and young bees.

Remarks.— The Black Bear group contains the smallest of the North American Bears, although the Black Bear is itself a good-sized beast. In the eastern part of the United States the cinnamon phase is very rare, but in the western part of its range it is about as common as the black phase. The Black Bear is much the same wherever he is found, but local abundance or scarcity of food sometimes produces greater or lesser size, and in addition some habits have produced sufficiently profound changes to warrant the establishment of different species. Of the 14 species and subspecies currently recognized, those below listed are the best known.

RELATED SPECIES

American Black Bear.— *Ursus americanus americanus* Pallas. The typical stock. Greater part of wooded North America, with the exception of the southeastern United States and northeastern Canada.

Louisiana Black Bear.— *Ursus luteolus* (Griffith). Size large; molar teeth very large. Normally black but cinnamon phase is known. Louisiana to Texas.

Florida Black Bear.—*Ursus floridanus* Merriam. Very large; wholly black. Everglades of Florida.

Queen Charlotte Islands Black Bear.— *Ursus carlottae* Osgood. Large; skull longer; teeth larger and heavier. Glossy black. Queen Charlotte Islands, British Columbia.

See also Glacier Bear and Kermode's Bear.

BLACK BEAR

Although powerful animals, the Black Bears are notoriously timid, so far as man is concerned, and to stalk one unaided is a task to try any hunter's patience

This Bear has been described, by one who has studied it in the open for nearly thirty years, as "the most amusing, the most ludicrous, the most human and understandable of our wild animals." In its native state, it exists in larger numbers and is more widely distributed than any other species of bear; and in captivity, it is one of the most "popular" of quadrupeds. It is the performing Bear *par excellence,* the Bear that can climb a tree; and its cleverness in learning tricks, its general tractability, and its playful disposition have combined to make it an invariable as well as an invaluable feature of most menageries.

Paradoxical as it may seem to say so, not all Black Bears are black. The ten or twelve members of the group show remarkable varieties of coloration, including glossy black, yellow-brown, olive-yellow, and mouse color; in the region of Flat Head Lake, in Montana, a number of albinos were seen. This variation in color has often given rise to the mistaken idea that the black and the brown individuals of the group are different species. They are not.

Black Bears mate just before going into winter quarters. They are not particular about their winter home. The hibernating den may be any place that offers a fair promise of privacy and protection. A favorite device of the Black Bear is "to dig a hole under the butt end of a fallen tree, rake a few leaves into the opening, and then crawl in himself." Mr. William H. Wright, the well-known writer on bears, had a tame Bear which made a winter home for himself under the carriage-house, foraging for rags with which he covered the floor several inches thick, and "once he came back dragging a fine cashmere shawl that he had pulled off a clothes line where a neighbor had hung it to air."

The beginning of the hibernation period varies with the weather and the locality. In the northwest it is from November to January; but the Black Bear will often come out for a time, if a warm spell occurs. It is a mistake to suppose that hibernating Bears are in a kind of comatose state, like the Woodchuck. They sleep, it is true; but they are easily aroused, and more than one hunter who has fallen through a crust of snow and landed on top of a hibernating Bear has found the animal to be very much awake. In captivity, hibernating Bears neither eat nor drink.

"All Black Bears hibernate during the winter months," says Daniel J. Singer. "There are, however, woodsmen in the South who disagree with me on this point, saying that they have seen their tracks during every month of the winter, and the mild climate does not force them to lie up in a cave or den as it would in the more severe weather of northern latitudes. I have myself seen bear tracks during the winter months, and even in the deep snow of the northern States. But this is the exception, and I have no doubt that these Bears are simply shifting to another sleeping place, having been driven out for one reason or another. Their dens may not have been well chosen, and they possibly became leaky, or exposed to the winds, or some hunter might pass that way with a keen-nosed, inquisitive canine that would cause him to roll out in a hurry. It is safe to say, all Black Bears den up, both North and South, some time between November 1st and January 1st, depending upon the altitude, weather and latitude. They emerge in the spring, usually from the first of April to the middle of May, according to conditions, the males often appearing some two weeks before the females. It is at this time in the spring, just after they have left their winter quarters, that a Bear's pelt is in its prime. During hibernation, as no food is laid up, they, of course, do not eat, nor do they drink, unless they make use of the snow that has fallen about them. Contrary to the general supposition, they are not in a deep coma or hazy condition, for they are easily aroused. It is true that they sleep, but are quick to detect danger and fully equal to the occasion of making off and looking up other quarters if disturbed.

"Another much mistaken idea about the Black Bear is that he emerges from his winter quarters very thin and emaciated (this so far, is true); that he is desperately hungry after his long fast; or is terribly ferocious, and inclined to attack anything on sight, man included. This is not so, although I have often heard it so stated. Not even a Black Bear with his enviable digestive apparatus can or does indulge in a hearty meal after so long a fast. The organs of a Bear are no different from those of a man in this respect, and after their long disuse are only capable of assimilating the daintiest morsels of food — such as grass shoots, tender roots and the like. In fact, at first he shows little or no desire to eat."

Photograph by J. H. Murphy

BLACK BEAR CUB

Taking an observation on a fallen tree

Black Bear cubs, numbering one to four — litters of the latter size are by no means uncommon — are born in the winter den of the mother between January and March, and from six weeks to two months before the mother comes out. They are almost naked, toothless, and their eyes do not open for some time. Single cubs vary in weight from eight to eighteen ounces. Usually, though not always, the Black Bear mother leaves her cubs to shift for themselves at the close of their first summer.

In the matter of food the Black Bear is easy to please. Centipedes, bumblebees, and hornets; wild white clover and skunk-cabbage roots; frogs, toads, and field mice — all are acceptable to him. He is, too, inordinately fond of ants. He will run one of his forelegs deep down into an anthill, give his paw a twist, and await results. "Out rush the ants, mad as hornets and looking for trouble. They get it almost immediately. They discover the Bear's furry paws and begin to swarm over them. And as fast as they appear the Bear licks them up."

One characteristic of the Black Bear in feeding is that it does not cache its food. The Grizzly will store fish and hide a carcass; the Black Bear never does. The latter will learn to steal sheep, and is said to be a born pig thief.

As mentioned above, the Black Bear is preeminently a tree-climbing bear. Mr. Wright says: "He can climb as soon as he can walk, and his mother takes clever advantage of the fact. She sends her cubs up a tree whenever she wants them off her hands for a time — uses trees, indeed, very much as human mothers, who have no one to watch their children while they work, use day nurseries. The first thing a Black Bear mother does when any danger threatens is to send her cubs up a tree. . . In all my experience I have never known cubs, when thus ordered into retirement by their mother, to come down from the selected tree until she called them. . . . Later in life the Black Bear comes to regard trees as its natural refuge from all dangers. . . They can climb, and that with almost equal ease, any tree that will hold their weight; from a sapling, so small that there is just room for them to sink one set of hind claws above the other in a straight line, to an old giant so big that they can only cling to its face."

In the wild state, Black Bears will play together, and they "have a funny trick of pretending not to see each other when they meet." They are not given to systematic labor in seeking their food; will "work hard at any kind of mischief, but seem to hate to work steadily for business purposes." Probably no animal is so quick to evade the hunter. A recent writer asserts that on a highway in New Hampshire a Black Bear kept ahead of his automobile for a short distance when going at the rate of nearly thirty miles an hour.

The fur of the Black Bear is a valuable article of commerce. In the early part of the nineteenth century, in a single year 25,000 skins were imported into England, where they were used chiefly for military accoutrements.

There are so many tame Black Bears, and their tricks and antics are so familiar that it is scarcely necessary to refer to them here. It may, however, be of interest to cite an occasion when a well-known stunt was given with an unexpected variation. Mr. W. H. Wright, when in Missoula, Montana, had nailed up the door of the shed in which his tame Black Bear, Ben, was confined. Some boys broke it open, with serious results for one of them. The Bear's owner writes: "In front of my house a mob was gathering. . . . At first I could make neither head nor tail of the clamor, but finally gathered that that bloodthirsty, savage, and unspeakable Bear of mine had killed a boy; and upon asking to see the victim was told that the remains had been taken to a neighbor's house and a doctor summoned. . . . I found the corpse sitting up on the kitchen floor holding a sort of impromptu reception. . . . I could not help admiring the youngster's pluck, for he was an awful sight. From his feet to his knees his legs were lacerated and his clothing torn into shreds; and the top of his head — redder by far than ever nature had intended — was a bloody horror.

"It developed that the two Urlin boys had broken open the door of the shed and gone in to wrestle with the Bear. Ben was willing, as he always was, and a lively match was soon on; another of the boys joined in the scuffle. Then one of them got on the Bear's back. This was a new one on Ben, but he took kindly to the idea and was soon galloping around the room with his rider. Then another boy climbed on and Ben carried the two of them at the same mad pace. Then the third boy got aboard and round they all went, much to the delight of themselves and their cheering audience in the doorway. But . . . after a few circles of the room Ben suddenly stopped and rolled over on his back. And now an amazing thing happened. Of the three boys, one happened to fall upon the upturned paws of the Bear; and Ben, who for years had juggled rope balls, instantly undertook to give an exhibition with his new implement. Gathering the badly frightened boy into position, the Bear set him whirling. His clothing from his shoe tops to his knees was soon ripped to shreds and his legs torn and bleeding; his scalp was lacerated by the sharp claws until the blood flowed; his cries arose to shrieks; but the Bear, unmoved, kept up the perfect rhythm of his strokes. Finally the terrified onlookers realizing that something must be done, tore a rail from the fence and with a few pokes in Ben's side induced him to drop the boy. . . . So square and true had Ben juggled him that not a scratch was found on his face or any part of his body between the top of his head and his knees. He eventually came out of the hospital no worse for his ordeal, but I doubt if he ever again undertook to ride a Bear."

The early backwoodsmen found the Black Bear a troublesome neighbor. It liked Indian corn, and was not averse to a young pig. "Like the Deer," says Audubon, "it changes its haunts with the seasons, and for the same reason, viz., the desire of obtaining food. During the spring months it searches for food in the low alluvial lands that border the rivers, or the margins of the inland lakes. There it procures abundance of succulent roots, and of the tender, juicy stems of plants, upon which it chiefly feeds at that season. During the summer heat it enters the gloomy swamps, and passes much of its time in wallowing in the mud like a hog; it seizes a young pig, or perhaps a sow or calf. As soon as the different kinds of berries ripen, the Bear betakes itself to the high ground; next visits the maize fields, which it ravages for a while. After this the various kinds of nuts and grapes, acorns and other forest fruits, attract its attention. The Black Bear is then seen wandering through the woods to gather this harvest, not forgetting to rob every tree which it comes across."

By permission of the New York Zoological Society

BLACK BEAR

The Black Bear was the species first encountered by the early settlers on the Atlantic side of America. The Grizzly belongs to the Rocky Mountain region

According to Dr. Merriam, the food of the Black Bear "consists not only of mice and other small mammals, turtles, frogs, and fish, but also, largely of ants and their eggs, bees and their honey, cherries, blackberries, raspberries, blueberries and various other fruits, vegetables, and roots. He sometimes makes devastating raids upon the barn yards, slaying and devouring sheep, calves, pigs and poultry." Another writer, Mr. C. C. Ward, states, as the result of his own experience, that the Black Bear, "is growing more carnivorous and discontented with a diet of herbs. Assuredly, he is growing bolder. He is also developing a propensity to destroy more than he can eat, and it is not improbable that his posterity may cease to be frugi-carnivorous. It is fortunate that an animal of the strength and ferocity which he displays when aroused seldom attacks man. The formation of his powerful jaws and terrible canine teeth are well adapted to seize and hold his prey, and his molars are strong enough to crush the bones of an ox. His great strength, however, lies in his fore-arms and paws. His mode of attacking his prey is not to seize it with its teeth, but to strike terrific blows with his fore-paws. His weakness is for pork, and to obtain it he will run any risk. When the farmers, after suffering severe losses at his hands, become unusually alert, he retires to the depths of the forest and solaces himself with a young Moose, Caribou, or Deer. He seldom or never attacks a full grown Moose, but traces of desperate encounters, in which the Cow-Moose has battled for her offspring, are frequently met with in the woods."

CINNAMON BEAR

This is not a distinct species, but only the local name for Black Bear in one of its curious color phases. The Black Bear, indeed, runs through many varying shades, and often brown and black cubs are found in the same litter. In Alaska and the Rocky Mountains it is frequently found with a brown or cinnamon coat — hence its name. See description of Black Bear.

Photograph by J. M. Johnson

BLACK AND CINNAMON BEARS

Feeding together in Yellowstone Park. They are quite tame in this reservation

GLACIER BEAR

Ursus emmonsi (*Dall*)

General Description.— See also American Black Bear. In general like the Black Bear but smaller and body color a bluish-black with white-tipped hairs.

Dental Formula.— Same as for Black Bear.

Pelage.— Sexes similar. A remarkably soft pelage, the hairs not very long; rich underfur of a bluish-black, with many of the long hairs white or tipped with white; dorsal line from tip of nose to rump, the back of the short ears and outer surfaces of limbs, jet black; sides of the muzzle and lower anterior cheek are a bright tan; no brown elsewhere in pelage.

Measurements.— Smallest of American Bears. Height at shoulder, 2 feet.

Range.— St. Elias range of mountains southeasterly to Juneau.

Food.— Similar to that of the Black Bear.

Related Species

While there are no related species of similar color pattern, one with much the same status, and also considered by some as still another color phase of the Black Bear, is Kermode's Bear.

Kermode's Bear.—*Ursus kermodei* Hornaday. General form like Glacier Bear and like it in size. Color, white, more or less pure in tone. Range in British Columbia just south of Alaska.

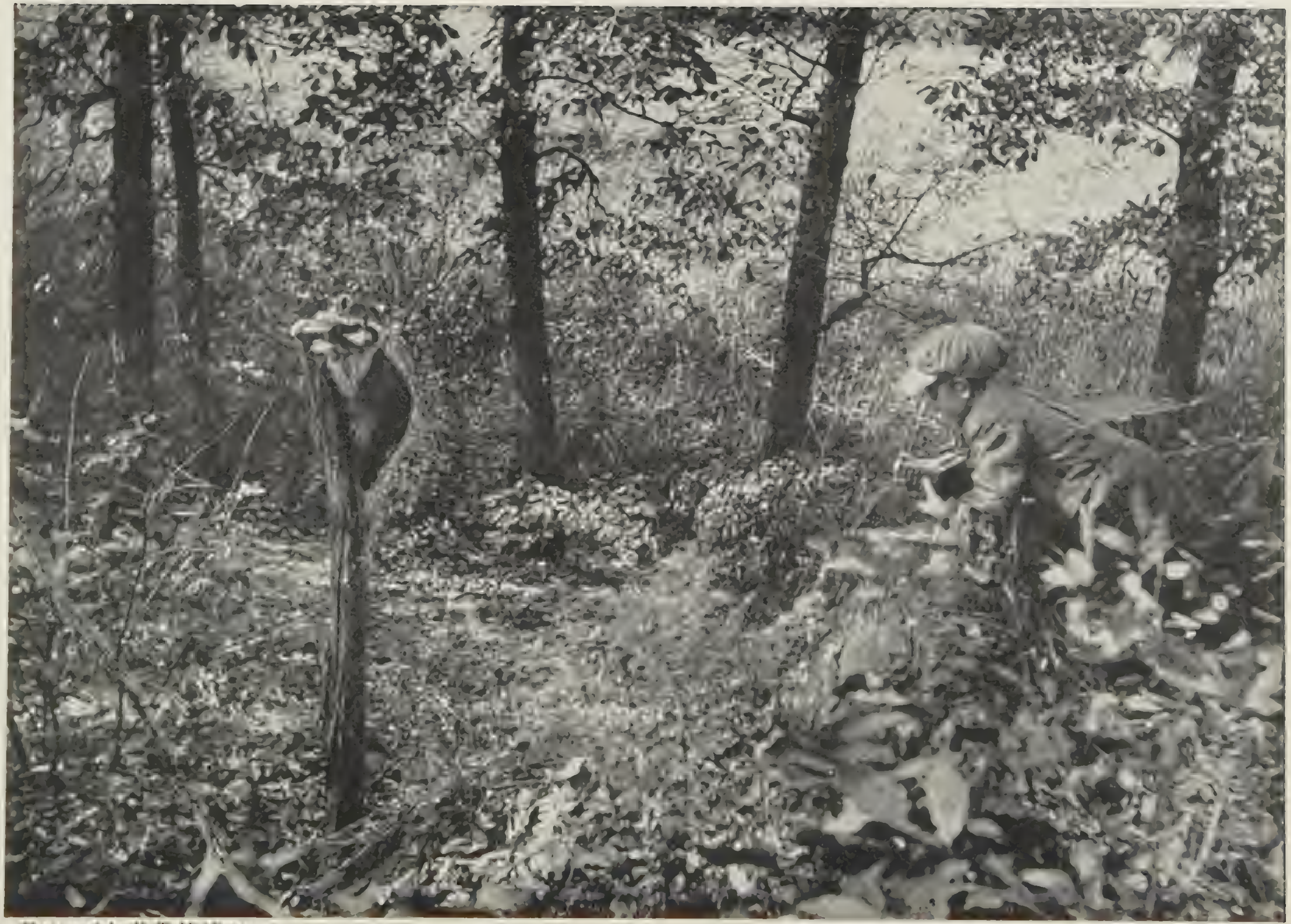
The Glacier Bear is a remarkable and little known animal that frequents the edges of glaciers in Alaska, chiefly near Mt. St. Elias. Some fur dealers call it the Blue Bear, from the indefinite bluish-gray tinge of its fur. The Glacier Bear is timid and retiring. It has been seen by but few hunters, and has not yet been captured alive for any zoological park, because of the wild bleak country which it frequents.

Although quite distinct in size and appearance from the American Black Bear many authorities today regard the Glacier Bear as but a color phase of the normal black variety. However, if this be the case it is a unique phase and has no duplication among the Black Bears in other regions of North America. According to this view, the Glacier Bear would be analogous to the Silver Fox, an unusual color phase of the common Red Fox.

The Glacier Bear has one of the softest and most beautiful coats of any of the Bears, and for this reason is much sought after. The fur has something of the smooth, fine texture of the seal, and in the same way is remarkably adapted to the double purpose of keeping the animal warm and dry. It is distinctively marked so that it cannot be mistaken. This is the smallest of all the American Bears, being only two feet high.

BLACK BEAR HUNTING BEES

The Black Bear is a great bee hunter, and is inordinately fond of honey



Photograph by H. T. Middleton

"LOOK PLEASANT, PLEASE"

This Raccoon is awaiting, somewhat anxiously, the result of the clicking instrument in the amateur photographer's hands

THE RACCOON FAMILY

(*Procyonidæ*)

THE Raccoon family in North America is limited to two members — the Raccoon, of which there are several species, and the Ring-tailed Cat. These animals are Carnivores, with head broad at the back and tapering rapidly forward to a narrow muzzle. Ears are of moderate size. Feet are plantigrade, with soles naked. The toes are free, and capable of being widely spread. The claws are curved, and non-retractile. The tail is semi-bushy, and generally ringed. The body is short and stocky.

One member of this family is among the best known of our native animals; while the other is almost entirely unknown even to many sportsmen. This is because of the latter's restricted range in the desert lands along the Mexican border.

EASTERN RACCOON

Procyon lotor (*Linnaeus*)

General Description.—A short-legged, long-haired animal the size of a small dog (Cocker Spaniel). Head broad; nose pointed; tail bushy, cylindrical, and annulated; ears erect and comparatively short; toes five on all feet; soles of feet naked; plantigrade; general color grayish or yellowish-gray, black patch about eye, and blackish rings around tail.

Dental Formula.— Incisors, $\frac{3-3}{3-3}$; Canines, $\frac{1-1}{1-1}$; Premolars $\frac{4-4}{4-4}$; Molars, $\frac{2-2}{2-2}=40$.

Pelage.— Sexes alike; young similar to adults but rather grayer at first. Above, grayish or dull brownish-gray becoming yellower on back, strongly yellow on nape and on tail, and a paler gray on belly and feet; long hairs of entire upper parts, especially of dorsal region, black-tipped, of lower parts, white-tipped; on cheek a black patch that includes eye and joins with the narrow blackish stripe that runs from nose to the dark color on forehead; face dull white, whitest in band above each eye; ear behind black, joining with a black patch on neck back of ear; tip of ear whitish behind; tail with 6 or 7 rings of very dark brown or black on a pale yellowish background; eyes dark, whiskers white.

Measurements.— Considerable variation. Average length, 32 inches; tail, 10½ inches; hind foot, 4½ inches. Weight 15 to 22 pounds.

Range.— Eastern America from Canada to Georgia, west to the Rocky Mountains north of Texas.

Food.— Quite omnivorous; frogs, fish, small mammals, birds and eggs, reptiles, insects, shell-fish, fruits, corn and grain.

Remarks.— The Raccoon has often been called the little brother of the Bear, this association being due mainly to the resemblance in build and in the naked, full-soled feet. The Raccoon is the sole representative (with the exception of the Ring-tailed Cat) of a family found only in the New World; there are no Raccoons in the Old World. Differences in size, color and proportions of the skull account for the separation of the North American Raccoons into six species and subspecies.

EASTERN RACCOON

The Raccoon's habit of washing its food before eating it, even in captivity, is one of its peculiar traits

RELATED SPECIES

Eastern Raccoon.— *Procyon lotor lotor* (Linnaeus). The typical animal described above. Eastern America from Canada to Georgia, west to Rocky Mountains north of Texas.

Florida Raccoon.— *Procyon lotor elucus* Bangs. Darker, shorter haired, longer tail. Eastern Georgia and Florida.

Hernandez Raccoon.—*Procyon lotor hernandezii* (Wagler). Size large; colors dark; tail tapering; black rings on tail, narrow. Along southern Pacific Coast north into California.

California Raccoon.—*Procyon psora psora* Gray. Found along the central Pacific Coast.

Desert Raccoon.—*Procyon pallidus* Merriam. See description following.

The Raccoon is found only in North and Central America, from Alaska in the north to Costa Rica in the south. It is common to the whole of the United States. Raccoons are generally found in the woodlands near civilization, but avoid the dense evergreen forests of the interior. Like the numerous bats and the flying squirrels, they are one of the most nocturnal of North American mammals, yet they may occasionally be seen abroad on cloudy days. In diet they are preferably flesh-eaters, feeding upon poultry, mice, young birds, bird's eggs, fresh-water tortoises and their eggs, frogs, fish, molluscs and insects. Occasionally, however, they vary this with a diet of nuts, fruits and corn. They delight to sport in the shallow water on the margins of pools and streams, where they capture the smaller fish lurking beneath the stones, and the fresh-water mussels buried in the mud and sand. They also catch such fish as happen into pools near the shore, although they are unable to dive in pursuit of their prey. They are, however, good swimmers. Although first-rate climbers, and making their nests in a hollow high up in some large tree, Raccoons cannot be considered arboreal animals. They neither hunt their prey among the tree-tops, nor feed upon the young shoots and twigs. Trees, however, form their nesting and breeding places, and likewise their refuge when pursued by human or other foes. With the falling shades of night they invariably descend to hunt their prey and search for food.

Photograph by Julian A. Dimock

UP A TREE

Brer 'Coon has an anxious look, as though he had sighted his arch enemy, the dog

This animal is known colloquially all over the United States as the "Coon." Its fur was highly prized by the early settlers, and Coon-skin caps were a staple article of apparel. In weight it is about equal to a common Fox, but it is short and stout. Restless, inquisitive, and prying, it is a most mischievous beast where farmyards and poultry are within reach. It kills the fowls, eats the eggs, samples the fruit, and if caught, generally puts up a stiff fight, although it sometimes shams death with all the skill of an Opossum. It is very fond of fish and shell-fish, and opens bivalves with wonderful skill. With one crunch it will break the hinge with its teeth; its paws complete the work of getting out the meat. It must have a delicate sense of touch, for in the task it rarely avails itself of sight or smell. It passes the mussel under its hind paws; then, without looking, it seeks with its forepaws the weakest place. It there digs in its claws, forces asunder the valves and tears out the flesh in fragments, leaving nothing behind.

The Raccoon has been one of the most valuable of the fur-bearing animals of North America, and is consequently much persecuted. Raccoon skins were formerly used as a recognized circulating medium in the States of the Mississippi valley.

The Raccoon may be easily caught in steel traps; but it is essential that these should be set under water near the margins of swamps or streams. The more sporting method in the South is to hunt these animals at night with specially trained dogs, which are usually a breed of Fox-hounds. It has often been stated that the Raccoon leaves a very faint foot-scent; but this opinion is controverted by some hunters who state that hounds will hunt a Raccoon at midday over snow, on a trail which has been made the previous night. The Raccoon after a short run invariably takes to a tree, and stays there until it is captured or escapes. It will stick tightly even while the tree is being felled to bring it to earth.

Like the Bear, the Raccoon is plantigrade in its manner of walking. It has been nick-named "the little brother of the Bear," from this and other similarities. For example, it is fond of dipping its food into water before eating it.

Concerning this trait, Mr. Witmer Stone says: "It is curious that the quaint custom of washing meat of all kinds before eating it should be clung to so religiously by the Raccoons of all parts of the country. Raccoons are so easily domesticated and prove such amusing pets, that accounts of tame Coons are to be picked up almost anywhere, and although exhibiting plenty of originality in most ways, they all seem to agree in this one particular, that when meat is offered them it must be thoroughly washed or else eaten under protest apparently, many a Coon preferring to go hungry rather than eat flesh which it has not been allowed to wash. Moreover, they are not willing to let any one else do the work for them, insisting rather on being allowed to do it all themselves, holding their food in both fore paws and sousing it about in the water until it is reduced to a pallid, flabby, unappetizing mess which only a Coon could look upon without misgiving."

Raccoons are most at home in a hollow tree. Here they construct a rough nest and rear five or six young every year. "The Raccoon hibernates during the severest part of the winter," says Dr. Merriam, "retiring to his nest rather early, and appearing again in February or March, according to the earliness or lateness of the season. Disliking to wade through deep snow he does not come out much till the alternate thawing and freezing of the surface, suggestive of coming spring, makes a hard crust upon which he can run with ease. He does not usually walk many miles during a single night, and consequently is soon tracked to the tree, in some hole of which he has retired for the day. It is unusual to find a Raccoon alone, for they commonly live and travel in small companies, consisting of several members of a single family."

Photograph by C. P. Cobb

SITTING TIGHT

The snows of winter do not bother the Raccoon as his fur coat is well lined

DESERT RACCOON

Procyon pallidus *Merriam*

General Description.— Much the same as Eastern Raccoon but colors pale, size medium.

Dental Formula.— See Eastern Raccoon.

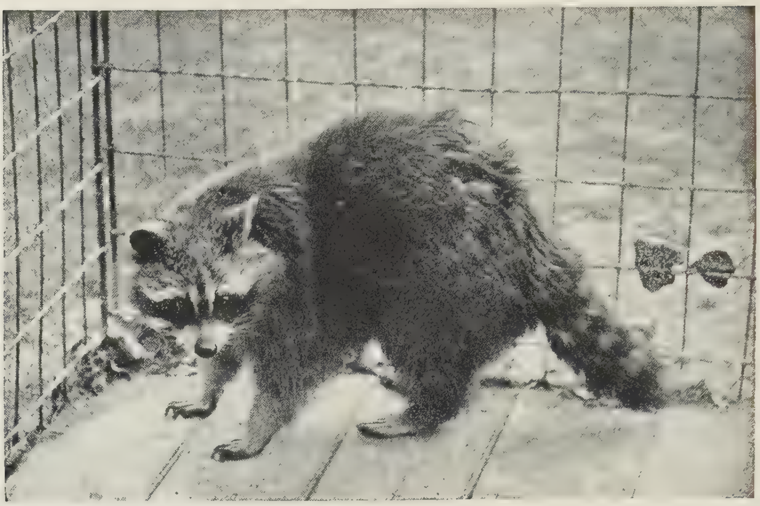
Pelage.—Above, pale gray darkened by short black tips to the coarse hairs; below, grayish-white, the drab underfur being nearly obscured; tail long and slender, with narrow blackish rings; hind feet pale gray.

Measurements.— Length, 33 inches; tail vertebrae, 12 inches; hind foot, 5 inches; height of ear above crown, 2 inches.

Range.— Colorado Desert, California.

Food.— Fish, birds, small mammals, frogs and a few insects.

Remarks.— This is a pale desert adaptation of the genus. Because of the wide differences in the environments of the Desert and Eastern Raccoons it is not surprising to find some difference in their habits. The Desert Raccoon, however, is true to his descent to a considerable degree. For related species see under Eastern Raccoon.



Photograph by C. Reid

DESERT RACCOON

A near cousin of the Eastern species, but with paler markings

The Desert Raccoon is the western cousin of our more familiar friend. It is found from the treeless wastes of Colorado to the Sierra Nevada range, and varies both in color and habits to some extent from the common species. The heat of the sun and lack of shade have changed the hue of the fur from brown or black to dull gray. The animal is an inhabitant of bushy retreats and holes in rocks, and seeks its food along the ground. Where streams are encountered it is fond of fishing; it will indeed follow along water courses for long distances; and it will not disdain birds as a variant from its usual diet of rats, mice, frogs and insects. It does not hibernate like the eastern type, as the milder weather does not make such a course necessary. It is by nature a night prowler, its scent being so keen as to permit it to hunt its prey unerringly over the desert wastes, but it also roams occasionally by day.

RING-TAILED CAT

Bassariscus astutus *(Lichtenstein)*

Other Names.— Civet Cat, Bassarisk, Bassaris, Cacomistl, Mountain Cat, Raccoon Fox.

General Description.—Size a trifle smaller than domestic cat. A slender graceful animal with a long cylindrical tail marked by black rings alternating with white. Muzzle pointed; ears rather large; pads of feet naked, soles hairy, digitigrade. General color, above buffy, tinged with black; below white; tail white with 6 or 8 black rings. Fur fairly soft.

Dental Formula.— Incisors, $\frac{3-3}{3-3}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{4-4}{4-4}$; Molars, $\frac{2-2}{2-2} = 40$.

Pelage.— Adults: Sexes similar. Above yellowish-brown and gray mixed, with the long hairs black tipped; below white; legs and feet like body; tail above with alternate black and white bands and black tip; the black does not meet on under side of tail, so there is a continuous white line down the center of the under side. Young: Much as adults.

Measurements.— Length, male, 30 inches; tail, 15 inches; hind foot, 2½ inches; ear, 1½ inches. Weight 2½ pounds. Female a trifle smaller.

Range.— California, Texas, Arizona, New Mexico.

Food.— Small mammals, birds and eggs.

Remarks.— The American Ring-tailed Cat is easily distinguished from any other North American mammal by its long annulated tail and general appearance. Its closest relative, the Raccoon, is much larger and has a shorter tail. The name Civet Cat applied to this animal is really a misnomer, as the Civet Cats are found only in the Old World, but this name has been used locally in the West in place of the more proper one of Ring-tailed Cat.

Related Species

American Ring-tailed Cat.— *Bassariscus astutus astutus* (Lichtenstein). The typical form as described above. California, Arizona, Texas, New Mexico.

California Ring-tailed Cat.— *Bassariscus astutus raptor* (Baird). Darker with less gray, buffy white below. Rings on tail broader. California and Oregon.

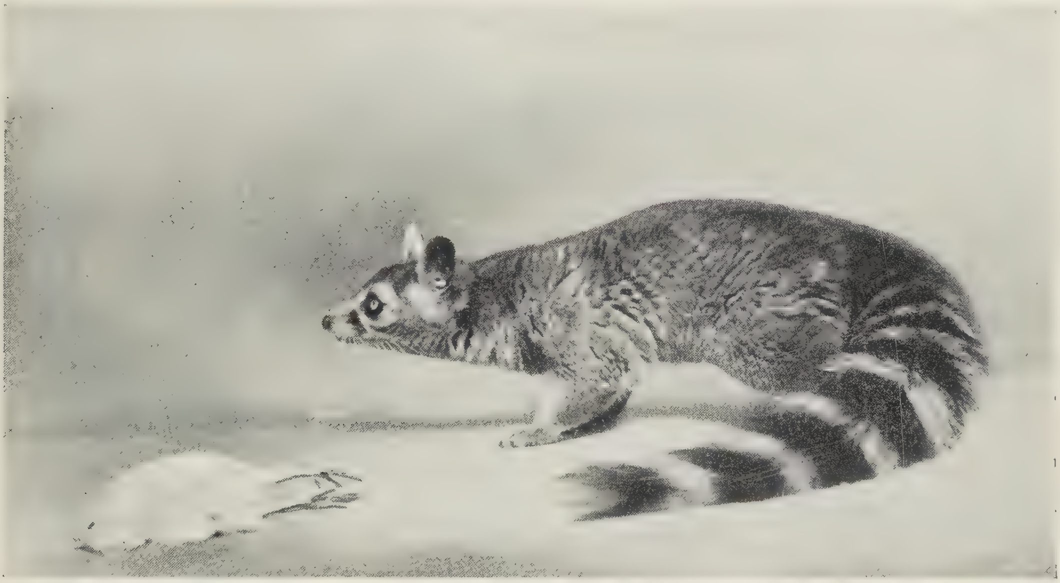
Texas Ring-tailed Cat.—*Bassariscus astutus flavus* Rhoads. Smaller; tail often completely encircled by black rings; blackish tawny above. Texas.

Oregon Ring-tailed Cat.— *Bassariscus astutus oregonus* Rhoads. Dorsal region intense black; below strongly brownish-yellow. Oregon.

The American Civet Cat has the misfortune to be wrongly named. It is not a Cat, being more like a weasel; nor does it have any odor of civet about it. Dr. Coues speaks of it as the Bassarisk; and the reader may find other references to it as the "Bassaris," "Cat Squirrel" (so called in Texas); "Mountain Cat," and "Ring-tailed Cat" (California), and "Cacomistl" (Mexico). Dr. D. G. Elliot terms it the "Raccoon Fox," and this seems a very good name for it; for, as Dr. Hornaday pertinently remarks: "The Bassarisk is, after the true Raccoon, the only animal in the United States possessed of a long, bushy tail with alternating black and white rings around it . . . and it has a many-sided appetite like a Raccoon."

The Ring-tailed Cat, is found in Mexico north to California. In Texas, the tawny variety is common throughout the State except in the open plains of the western half. Although mainly a dweller in cliffs and rocks, it is found also in the chaparral, mesquite, and cactus plains of the southern part of the State right down to the coast, where it secures ample protection and small game in greater abundance than in its higher rocky haunts. According to Vernon Bailey ("Biological Survey of Texas"), at night "they prowl along the ledges of cliffs from cave to cave, leaving the prints of their little, round, catlike feet in the dry dust of the darkest corners," and they will steal Wood Rats and White-footed Mice caught in the traps of collectors. Owing to the inaccessibility of their rock dens, and their nocturnal habits, they are seldom seen in the wild state. Mr. Bailey trapped a pair in one of the canyons of the Rio Grande and he says, "the male fought and screamed viciously as we approached, but the female was quiet and gentle. Even in the traps the animation and brightness of their faces were wonderful. The large ears, when directed forward, were in constant motion. The long, black, vibrating moustache, the striking black and light face markings, and, most of all, the big, soft, expressive eyes give a facial expression of unusual beauty and intelligence."

They feed on small rodents, birds, insects (including the centipede), and are not averse to fruit. Traps set for them are often baited with meat. Their nests, which are lined with moss, are placed in the hollows of trees, and there are usually three or four young in a litter. They are very easily tamed, and are made household pets by California miners and Texas ranchmen. The latter say that they make better mousers than domestic cats, and, if given free run of the premises, will lose no time in clearing a cabin of rats and mice.



By permission of the New York Zoological Society

RING-TAILED CAT

A little known wanderer along our Southwestern border, which has been blessed with many names

THE WEASEL FAMILY

(Mustelidæ)

A NUMEROUS group of fur-bearers comprise the Weasel family, which is scattered all over the world, with the exception of Australia and Madagascar. They include Weasels, Badgers, Skunks, Minks, Otters, Martens and Wolverenes. They are small in size, some being quite diminutive, but as a rule are fierce and bloodthirsty. Their bodies are long and slender, their motions are quick and graceful, their strength and endurance prodigious. They have short, powerful legs with feet adapted to running, climbing, digging, burrowing, or swimming. Most members of the family take readily to the water. Other distinguishing traits are: a single tubercular molar tooth on each jaw; five-toed feet which are both plantigrade and digitigrade; absence of the cæcum; presence of anal musk glands which are more or less completely under control.

The members of this family differ widely in coloration. In some of the northern forms a single animal will change its dress from dark in summer to light in winter. Others, such as the Skunk, will have broad stripes of white contrasting with black or brown. Others, like the Otter, have fur of a uniformly dark tint; while a nearly related member will possess a coat of wonderful brilliance.

The wide range of colors coupled with the softness of the fur has made the members of this family of great economic importance. They are highly prized among furriers, some of the species bringing high prices.

AMERICAN WOLVERENE

Gulo luscus *Linnæus*

Other Names.— Glutton, Carcajou.

General Description.— A robust animal built like a small Bear and weighing 20 or 25 pounds. Tail bushy, short; soles hairy; ears short; claws strong, curved, partially retractile; fur moderately long; color blackish brown with lighter areas on face and along sides. Sexes alike. A very powerful animal for its size.

Dental Formula.— Incisors, $\frac{3-3}{3-3}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{4-4}{4-4}$; Molars, $\frac{1-1}{2-2}=48$.

Pelage.— General color deep blackish-brown, paler and grayer on crown and cheeks; band of pale chestnut from shoulder to tail where the two bands meet; nearly white on rump in some specimens; more or less yellowish white spots on throat and chest; claws whitish horn color. Little seasonal variation.

Measurements.— Length, male, 36 to 38 inches; tail, 7 inches; hind foot, 7 inches; ear, 2 inches. Weight, 25 pounds.

Range.— Arctic America south to northern United States, and in Rocky Mountains to Colorado.

Food.— Mammals and birds; any mammal it can kill and occasionally animals found dead.

Remarks.— The Wolverene is the largest member of the family to which it belongs, the family of the Martens and Weasels. It is a wide-ranging beast but is not found south of the regions of heavy snowfall. It remains unchanged to any very noticeable degree throughout a wide area and but three species are described.

Related Species

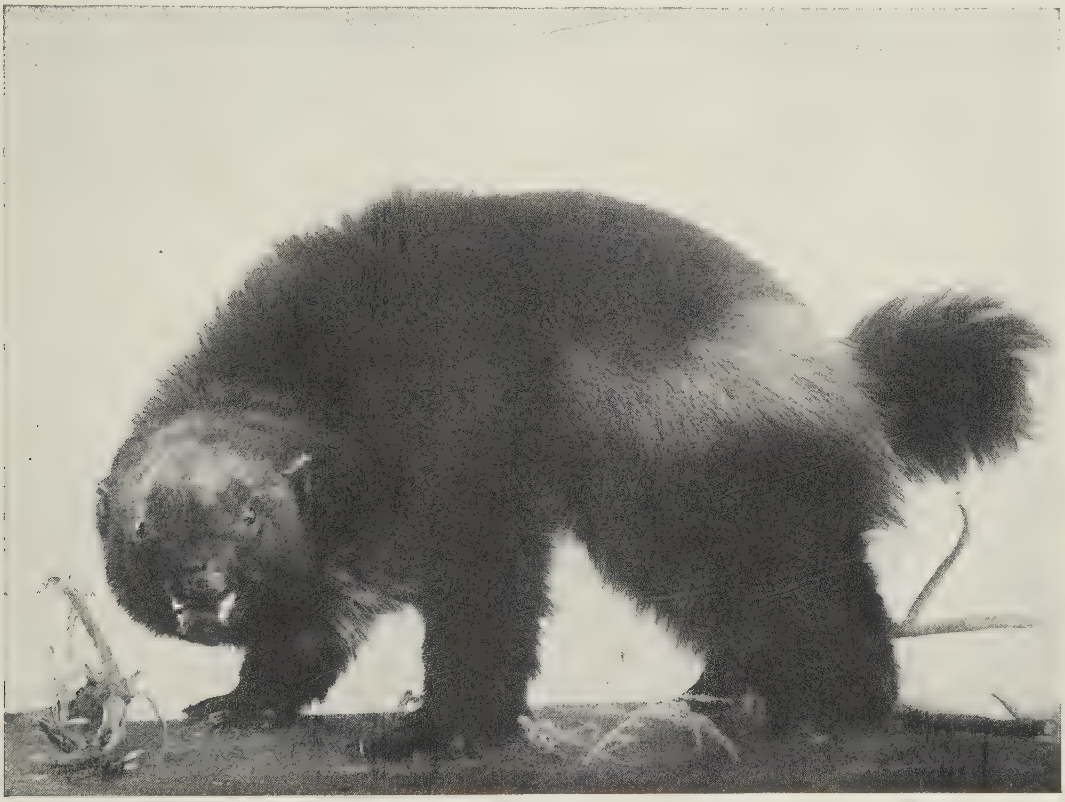
American Wolverene.—*Gulo luscus* Linnaeus. The typical species described above. Arctic and sub-Arctic America north of the United States, south in the Rocky Mountains to Colorado.

California Wolverene.— *Gulo luteus* Elliot. Color about buffy. California.

Alaska Wolverene.— *Gulo hylaeus* Elliot. Color very dark, without buff or gray. Found in various parts of Alaska.

The Wolverene, also known as the Glutton and Carcajou, has been the subject of more legends and quaint stories than almost any other animal. According to the Indians, it is inhabited by an evil spirit. The French Canadian also gave it strange characteristics, under the name of Carcajou. In fact, the myths clustering about this animal date back as early as the sixteenth century, in Europe. Olaus Magnus (1562), to whom is commonly attributed the earliest mention, gives a most extraordinary account, made up of the then current popular traditions and superstitions, and tales of hunters or travelers, unchecked by any proper scientific inquiry; although, to do him justice, he does not entirely credit them himself. We may be sure that such savory morsels of animal biography did not escape the notice of subsequent compilers, and that they lost nothing of their flavor at the hands of Buffon. Probably no youth's early conceptions of the Glutton were uncolored with romance; the general picture impressed upon the susceptible mind of that period being that of a ravenous monster of insatiate voracity, matchless strength, and supernatural cunning, a terror to all other beasts, the bloodthirsty master of the forest.

These stories are highly absurd, says Coues, who describes the Wolverene as "simply an uncommonly large, clumsy, shaggy Marten or Weasel, of great strength, without corresponding agility, highly carnivorous, like the rest of its tribe, and displaying great perseverance and sagacity in procuring food in its northern residence when the supply is limited or precarious, often making long uninterrupted journeys, although so short-legged. It is imperfectly plantigrade, and does not climb trees like most of its allies. It lives in dens or burrows, and does not hibernate. It feeds upon the carcasses of large animals which it finds already slain, but does not destroy such creatures itself, its ordinary prey being of a much humbler character. It is a notorious thief, not only of stores of meat and fish laid up by the natives of the countries it inhabits, the baits of their traps, and the animals



Photograph by American Museum of Natural History

WOLVERENE

The Wolverene is thought by Indians and trappers to be possessed of an evil spirit, such demoniacal cunning does it exhibit. Many legends cluster about the Glutton, or Carcajou, as it is also called

so caught, but also of articles of no possible service to itself; and avoids with most admirable cunning the various methods devised for its destruction in retaliation."

The fur of the Wolverene is highly valued both by civilized and uncivilized people. A number of skins sewed together make a very beautiful carriage robe or hearth-rug, and the pelts are in common use for these purposes. The Indians and Esquimaux use the fur as they do that of the Wolf, for fringing their garments, the skin being in strips for this purpose.

The Wolverene ranges in greater or less abundance all over the northern portions of this country. It appears to be particularly numerous in the Mackenzie river region, and it fairly infests the whole country bordering the lower portions of this river and the west side of the mountains. From this country, many accounts from various officers of the Hudson's Bay Company bear witness to the wonderful cunning and sagacity of the beast, as well as its ferocity, and represent it to be the greatest enemy with which the hunters and trappers have to contend in the pursuit of fur-bearing animals.

To the trapper, Wolverenes are especially annoying. When they have discovered a line of marten traps they will never abandon the road, and must be killed before the trapping can be successfully carried on. Beginning at one end, they proceed from trap to trap along the whole line, pulling them successively to pieces, and taking out the baits from behind. When they can eat no more, they continue to steal the baits and cache them. If hungry, they may devour two or three of the martens they find captured, the remainder being carried off and hidden in the snow at a considerable distance. The work of demolition goes on as fast as the traps can be renewed.

The propensity to steal and hide things is one of the strongest traits of the Wolverene. To such an extent is it developed that the animal will often secrete articles of no possible use to itself. Besides the wanton destruction of traps, it will carry off the sticks and hide them at a distance, apparently in sheer malice. Mr. Ross has given an amusing instance of the extreme of this propensity: "The desire for accumulating property seems so deeply implanted in this animal, that, like tame ravens, it does not appear to care much what it steals so that it can exercise its favorite propensity to commit mischief. An instance occurred within my own knowledge in which a hunter and his family having left their lodge unguarded during their absence, on their return found it completely gutted — the walls were there but nothing else. Blankets, guns, kettles, axes, cans, knives and all the other paraphernalia of a trapper's tent had vanished, and the tracks left by the beast showed who had been the thief. The family set to work, and by carefully following up all his paths recovered, with some trifling exceptions, the whole of the lost property."

Fatal tragedies have occurred in pioneer camps, on account of such thefts — the man who suffered the loss of his goods often suspecting one of his human neighbors.

Though very clumsy, the Wolverene manages to capture, at times, such prey as hares or grouse, and successfully attacks disabled deer. It also feeds on offal or carrion; in fact, anything that it can catch or steal. Its own flesh is only eatable in the extreme of starvation. Wolverenes bring forth in burrows under ground, probably old bear washes, and have four or five young at a birth. It is very rarely that they are discovered at this period or while suckling their young. One reason, however, may be that they reproduce late in June and early in July, when the mosquitoes are so numerous that no one who can avoid it goes abroad in the woods. The mating season is in the latter part of March. The female is ferocious in the defense of her young, and if disturbed at this time will not hesitate to attack a man. Indeed, Indians have been heard to aver that they would sooner encounter a she-Bear with her cubs than a Carcajou under the same circumstances. In October, when the rivers set fast, the Wolverenes reappear in families, the young still following their dam, though now not much her inferior in size. They are full grown when about a year old. In early infancy, the cubs are said to be a pale cream color.

The ferocity of the Wolverene, no less than its cunning, is illustrated in some of the endless occasions on which it matches its powers against those of its worst enemy. A man had set a gun for a Carcajou which had been on his usual round of demolition of Marten traps. The animal seized the bait unwarily, and set off the gun; but owing to the careless or improper setting, the charge missed or only wounded it. The Carcajou rushed upon the weapon, tore it from its fastenings, and chewed the stock to pieces. It is added to the account of this exploit that the beast finished by planting the barrel muzzle downward in the snow; but this may not be fully credited. The stories that pass current among trappers in the North would alone fill a volume, and they are quite a match for those that Olaus Magnus set down in his book centuries ago. But we need not go beyond the strict fact to be impressed with the extraordinary wit of the beast, whom all concur in conceding to be "as cunning as the very devil."

The Wolverene is almost exclusively nocturnal, there being but few instances of its having been seen abroad during the day; and it has been seen to sit up and shade its eyes with its paws, as if suffering from the unaccustomed light. It does not hibernate, and there is no marked difference in the color of the winter and summer coat. In spite of its clumsy-looking appearance the animal when disturbed can make off at a very rapid pace. It likewise ascends rough-barked trees with facility, although it is said that its climbing powers are only exerted when it scents food. In the pursuit of prey the Wolverene will readily swim rivers. As a rule it is silent, although when attacked it will give vent to angry growls.

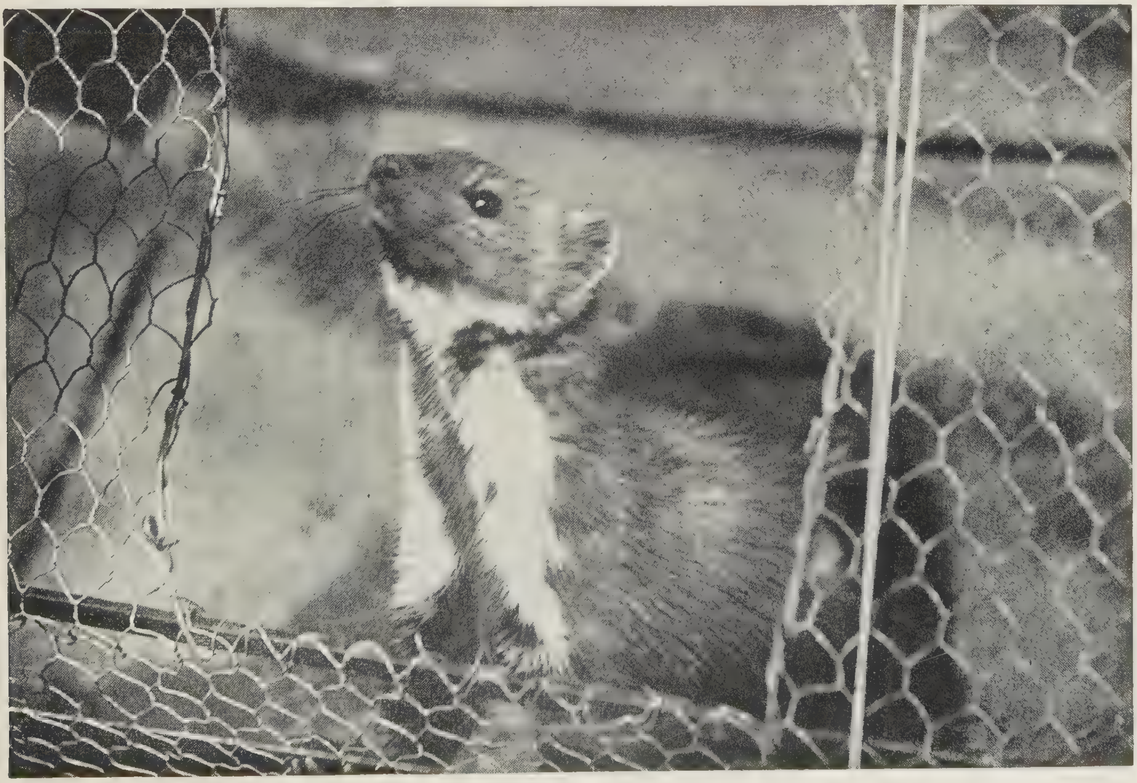
These animals are found both solitary and in pairs, but generally solitary. During the day they live concealed in subterranean holes, which are usually their breeding-places, and which are frequently the deserted lairs of Bears. In North America the young are born in June or July, the number of individuals in a litter, as before stated, being generally four or five, but it has also been noticed by hunters that there are sometimes only two cubs.

AMERICAN MARTEN

Martes (= Mustela) americana (*Turton*)

Other Names.— Pine Marten, American Sable.

General Description.— A long, slender-bodied animal rather smaller than a house cat. Limbs short, digitigrade; tail moderate, inclined to be bushy; soles furred, pads naked; claws compressed, acute, semi-retractile; ears large; head roughly triangular with sharp nose; color above orange-brown, belly brownish, spot on breast orange. Habits arboreal.



PINE MARTEN

On account of their beautiful fur these Martens are so persistently hunted that they are now rare

Dental Formula.— Incisors, $\frac{3-3}{3-3}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{4-4}{4-4}$; Molars, $\frac{1-1}{2-2} = 38$.

Pelage.— Sexes identical; young soon appearing as adults. Head grayish-brown, darkest on nose which is smoke brown; throat and spot on breast rich orange; general body color orange-brown clouded with black or blackish-brown on back and belly; legs, feet and upper part of tail black, underpart of tail rufous, save tip which is black. There is a considerable individual range of variation in color of pelage. Pelage same in winter as in summer. The hairs are soft and glossy and there is an under-fur of very soft short hair.

Measurements.— Length, 25 inches; tail, 8 inches; hind foot, 3¾ inches.

Range.— Boreal North America, west to Rocky Mountains, south to New York.

Food.— Largely squirrels, but also birds and their eggs, and at times other small mammals.

Remarks.— Owing to its particularly characteristic markings this animal should be confused with none of the other small fur-bearers. It is closely related to the Weasels and to the Minks. Eleven different forms of the American Marten are recognized; among these the following are prominent.

RELATED SPECIES

American Marten.— *Martes americana americana* (Turton). The typical species described above. Forested North America from New York to the Rocky Mountains, northward.

Saskatchewan Pine Marten.— *Martes americana abieticola* (Preble). Much larger. Saskatchewan, Canada.

Alaska Marten.—*Martes americana actuosa* (Osgood). Larger, grayer. Alaska.

Kenai Marten.— *Martes americana kenaiensis* (Elliot). Smaller, paler; lacking orange throat patch. Kenai Peninsula, Alaska.

Newfoundland Marten.— *Martes atrata* (Bangs). Larger; much darker, color deep chocolate. Newfoundland.

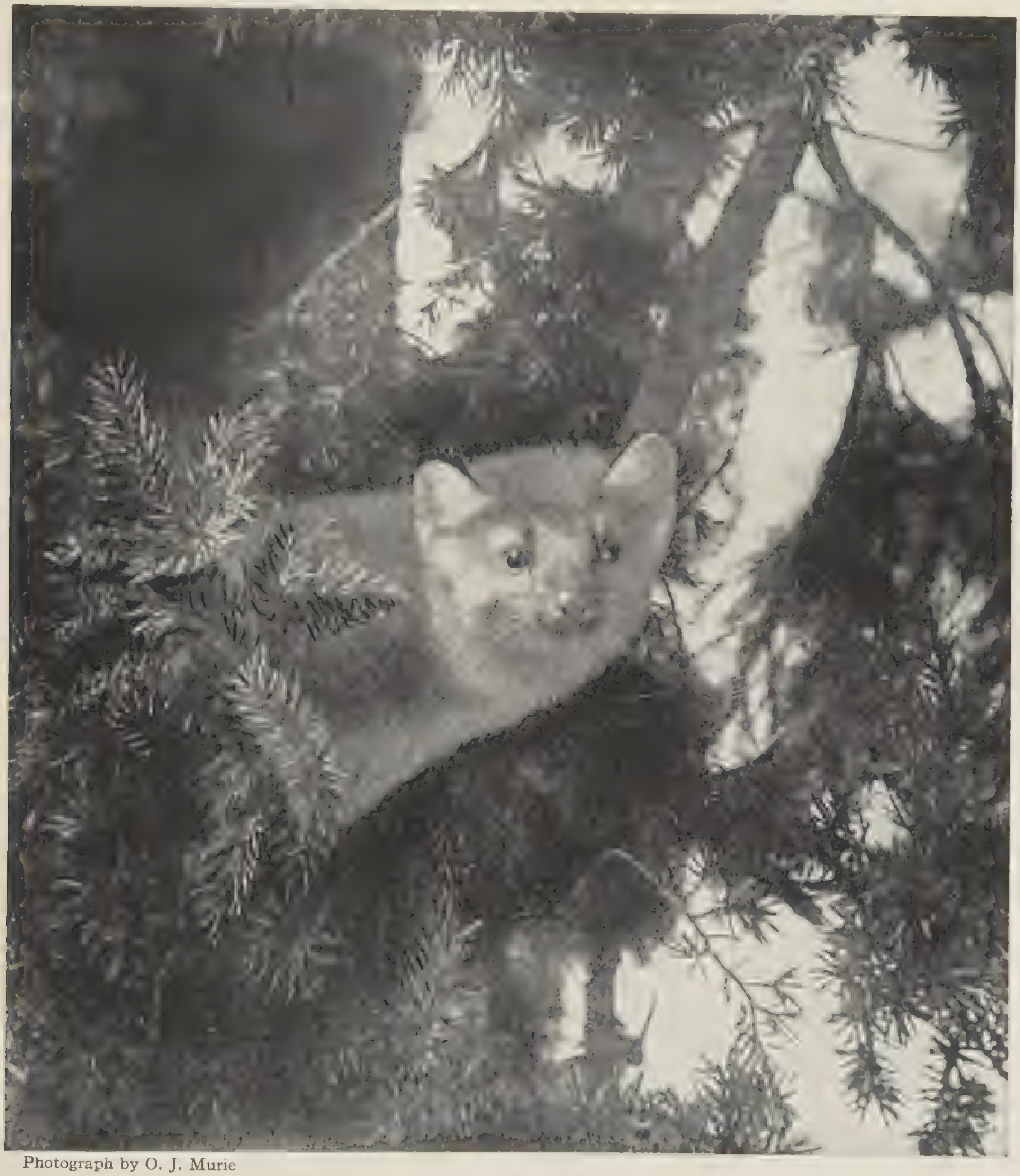
Labrador Marten.— *Martes brumalis* (Bangs). Larger and darker. Labrador.

Pacific Marten.— *Martes caurina caurina* (Merriam). Colors averaging darker; larger; throat spot orange red. Pacific Coast from San Francisco to Puget Sound.

The Martens in America have been given many names, due at first to the effort to distinguish them from their foreign kin. Although the American animal was known in very early times, long before it received a distinctive name, having been referred alternately to the European Pine Marten and Asiatic Sable, or to both of these species, very little definite information upon its range and habits was recorded for many years. Pennant, our principal early authority on the animals of the North American fur countries, considered it the same as *M. martes,* and drew its range accordingly. He states that it inhabits, in great abundance, the northern parts of America, in forests, particularly of pine and fir, nesting in the trees, bringing forth once a year from four to eight young; that its food is principally Mice, but also includes such birds as it can catch; that it is taken in dead-falls, and sometimes eaten by the natives. As an article of commerce in comparatively early times, we notice the sale of some 15,000 skins in one year (1743) by the Hudson Bay Company, and the importation from Canada by the French into Rochelle of over 30,000. "Once in two or three years," he adds, they "come out in great multitudes, as if their retreats were over stocked; this the hunters look on as a forerunner of great snows, and a season favorable to the chase." Such periodicity in numbers thus early noted is confirmed by later observations.

The Sable is ordinarily captured in wooden traps of very simple construction, made on the spot. The trap is a little enclosure of stakes or brush in which the bait is placed upon a trigger, with a short upright stick supporting a log of wood; the animal is shut off from the bait in any but the desired direction, and the log falls upon its victim with the slightest disturbance. A line of such traps, several to the mile, often extends many miles. The bait is any kind of meat, a Mouse, Squirrel, piece of fish, or bird's head. One of the greatest obstacles that the Sable hunter has to contend with in many localities is the persistent destruction of his traps by the Wolverene and Pekan, both of which display great cunning and perseverance in following up his line to eat the bait, and even the Sables themselves which may be captured. The exploits of these animals in this respect may be seen from the accounts elsewhere given. Hudson Bay trappers tell of a Sable road fifty miles long, containing 150 traps, everyone of which was destroyed throughout the whole line twice — once by a Wolf and once by a Wolverene. When thirty miles of this same road were given up, the remaining forty traps were broken five or six times in succession by the latter animal. The Sable is principally trapped during the colder months, from October to April, when the fur is in good condition; it is nearly valueless during the shedding in summer. Sometimes, however, bait is refused in March, and even earlier, probably with the coming on of the pairing season. The period of full furring varies both in spring and autumn, according to latitude, by about a month as an extreme.

Although the Sable is persistently hunted, it does not appear to diminish materially in numbers in unsettled parts of the country. It holds its own partly in consequence of its shyness, which keeps it away from the abodes of men, and partly because it is so prolific; it brings forth six to eight young at a litter. Its home is sometimes a den underground or beneath rocks, but oftener the hollow of a tree; it frequently takes forcible possession of a Squirrel's nest, driving off or devouring the rightful proprietor. Though frequently called Pine Marten, like its European relative, it does not appear to be particularly attached to coniferous woods, living in them simply because such forests prevail to a great extent in the geographical areas it inhabits.



Photograph by O. J. Murie

AMERICAN MARTEN

Martens are still to be found in the dense forests of pine and spruce, but have been so persistently hunted for their fur, that they are extremely shy

"The Sable," says Coues, "is no partner in guilt with the Mink and Stoat in invasion of the farm-yard, nor will it, indeed, designedly take up its abode in the clearing of a settler, preferring always to take its chances of food supply in the recesses of the forest. Active, industrious, cunning and predaceous withal, it finds ample subsistence in the weaker rodents, insectivora and birds and their eggs. It hunts on the ground for Mice, which constitute a large share of its sustenance, as well as for Shrews, Moles, certain reptiles and insects. An expert climber, quite at home in the leafy intricacies of tree tops, it pursues squirrels, and goes bird's-nesting with success. It is said also to secure toads, frogs, lizards, and even fish.

"The Sable has some of the musky odor characteristic of its family, but in very mild degree compared with the Mink or Pole-cat. With a general presence more pleasing, it combines a nature, if not less truly predacious at least less sanguinary and insatiable. It does not kill after its hunger is appeased, nor does a blind ferocity lead it to attack animals as much larger than itself as those that the Stoat assaults with success. Animals like the Rabbit and Squirrel form less of its prey than the smaller rodents and insectivores. In confinement, the Marten becomes in time rather gentle. It is sprightly and active, with little unpleasant odor."

Merritt Cary, in "A Biological Survey of Colorado," says: "In the dense forests of lodgepole pine and spruce, which clothe the upper slopes of the higher mountain ranges of northern Colorado, the Marten is still present in considerable numbers. It appears to be uncommon on all the southern ranges except the San Juan Mountains, where from a point northeast of Pagoda Springs west of Silverton and Telluride it is reported in good numbers. Martens are rarely observed below 8,000 or 8,500 feet, or the lower edge of the Canadian zone forest belt. They range regularly to timberline, however, and have been seen 1,500 feet above timberline near Silverton. Throughout their range Martens are hunted and trapped extensively, and consequently are not nearly so abundant as formerly. Skis are often used in hunting them in winter, when snow covers the mountains to a depth of several feet, and when pursued in this manner the animals quickly take refuge in trees where they are easily shot. Hunting Martens on skis is said to be very exciting sport, and at times hazardous, owing to the roughness of the country. This is a favorite method of hunting in Middle Park and in the San Juan Mountains. Most of the Martens secured, however, are taken in either steel traps or dead-falls. Although Colorado Martens are somewhat paler than those farther north, they yield a valuable fur."

PENNANT'S MARTEN

Martes pennanti (*Erxleben*)

Other Names.— Fisher, Pekan, Black Cat.

General Description.— A Marten, but much larger than the Pine Marten. See description. Body long, lithe and powerful; weight up to 18 pounds. Legs short; head short; muzzle pointed; ears prominent; tail moderately bushy. Color brownish-black, lighter on sides, browner below.

Dental Formula.— Same as given for Pine Marten.

Pelage.— Color same the year around; sexes identical. Color variable, but dark. Some specimens are glossy black, including tail and underparts; others are gray or grayish-white on head and neck; the majority of individuals have more or less white on chin, chest and abdomen. In general the body color is grayish-brown or brownish-black, lighter on sides and browner on belly; darker on snout, ears, feet, and tail; ears with pale linings; claws whitish horn color.

Measurements.— Length, male, 36 inches; tail, 14 inches; hind foot, 4 inches. Weight, 8½ to 18 pounds. Female, smaller.

Range.— North America north of 35° in forest covered country, except on Pacific coast where the Pacific Fisher is found.

Food.— Mice, squirrels, hares, porcupines, birds and eggs. Only rarely fish.

Remarks.— Although the name Fisher is applied to this animal it is inappropriate inasmuch as the animal is not a fisherman. But two varieties of this Marten are recognized.

RELATED SPECIES

Pennant's Marten, or Fisher.—*Martes pennanti pennanti* (Erxleben). The typical animal described above. Boreal North America north of 35° except on Pacific Coast.

Pacific Fisher.— *Martes pennanti pacifica* (Rhoads). Larger skull and upper molars; coloration in general darker. Various parts of the Pacific slope, California to Alaska.

The largest of all the Martens is an animal rejoicing in a number of names both popular and scientific, being variously designated as the "Pekan," "Fisher," "Pennant's Marten," "Black Fox," and "Black Cat." The two latter titles are due to the large size, stout build and dark color of the animal, which in point of form may be more aptly compared to a Fox than to a Weasel. Its general color is blackish brown, becoming gray on the head and neck; while the throat is distinguished by the absence of the light-colored patch distinctive of all the other species. It ranges over the greater part of North America, as far north as Alaska and south to the upper part of Texas. Continual hunting has, however, exterminated the animal from the more settled districts of the United States east of the Mississippi.

Dr. Merriam observes that "the name Fisher is somewhat of a misnomer, for these animals commonly frequent deep swamps and wooded mountain sides, away from the immediate vicinage of the water, and are not known to catch fish for themselves as do the Mink and Otter. However, they are fond of fish, and never neglect to devour those that chance to fall in their way. They prey chiefly upon hares, squirrels, mice, grouse, small birds and frogs, and are said to eat snakes. They also catch and feed upon their own congener, the Marten, and make a practice of devouring all that they discover in dead-falls and steel-traps. It also appears that Porcupines compose a considerable proportion of their food in some districts; specimens being sometimes killed with numbers of Porcupine-quills in their skin and flesh."

This Marten breeds but once a year; it brings forth its young in the hollow of a tree, usually thirty or forty feet from the ground. Two, three, and four young are produced in a litter. It has been known to offer desperate resistance in defense of its young, as on one occasion mentioned by Audubon. This animal, a young one, was kept in confinement for several days. "It was voracious, and very spiteful, growling, snarling and spitting when approached, but it did not appear to suffer much uneasiness from being held in captivity, as, like many other predacious quadrupeds, it grew fat, being better supplied with food than when it had been obliged to cater for itself in the woods." Another mentioned by the same author as having been exhibited in a menagerie in Charleston, S. C., some months after its capture, continued sullen and spiteful, hastily swallowing its food nearly whole, and then retiring in growling humor to a dark corner of its cage. Hearne, however, has remarked that the animal is easily tamed, and shows some affection at times. When taken very young, it may become perfectly tame, and as playful as a kitten. The Pekan is sometimes forced, by failure of other sources of supply, to a vegetarian diet, when it feeds freely upon beechnuts.

One hunter thus describes an encounter with this animal. "A servant, on one occasion, came to us before daylight, asking us to shoot a Raccoon for him, which, after having been chased the previous night, had taken to so large a tree that he neither felt disposed to climb it nor cut it down. On our arrival at the place, it was already light, and the dogs were barking furiously at the foot of the tree. We soon perceived that instead of being a Raccoon, the animal was a far more rare and interesting species, a Fisher. As we were anxious to study its habits we did not immediately shoot, but teased it by shaking some grape vines that had crept up nearly to the top of the tree. The animal not only became thoroughly frightened, but furious; he leaped from branch to branch, showing his teeth and growling at the same time; now and then he ran half-way down the trunk of the tree, elevating his back in the manner of an angry cat, and we every moment expected to see him leap off and fall among the dogs. He was brought down after several discharges of the gun. He seemed extremely tenacious of life, and was game to the last, holding on to the nose of a dog with a dying grasp. The animal proved to be a male; the body measured twenty-five inches, and the tail, including the fur, fifteen. The servant who had traced him informed us that he appeared to have far less speed than a Fox, that he ran for ten minutes through a swamp in a straight direction and then took to a tree.

"Species that are decidedly nocturnal in their habits frequently may be seen moving about by day during the period when they are engaged in providing for their young. Thus the Raccoon, the Opossum, and all our Hares, are constantly met with in spring, and early summer, in the morning and afternoon, while in autumn and winter they only move about by night. In the many Fox hunts, in which our neighbors were from time to time engaged, not far from our residence at the north, we never heard of their having encountered a single Fisher, in the daytime; but when they traversed the same grounds at night, in search of raccoons, it was not unusual for them to discover and capture this species. We were informed by trappers that they caught the Fisher in their traps only by night."

In its chiefly nocturnal and largely arboreal habits the Fisher Marten resembles most of the other members of the group; its agility in the forests is, however, very remarkable, and when much frightened, or in pursuit of prey, it has been known to leap from tree to tree. The nest, as before stated, is usually built in the hole of a tree at a great height above ground; the young being generally born at the end of April or beginning of May.

The Fisher is trapped for its skins in the northern parts of America from October till May, those captured in the early part of the season being in the best condition.

ARCTIC WEASEL

Mustela (= Putorius) arctica (*Merriam*)

Other Names.— Ermine, Stoat.

General Description.— A very small, slender and long-bodied Carnivore. Legs short; tail long, moderately bushy, black at the tip; ears of moderate size; soles haired; general color in summer, yellowish-brown above, under parts yellow; in winter white everywhere except for black tipped tail. Females much smaller than males.

Dental Formula.— Incisors, $\frac{3-3}{3-3}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{3-3}{3-3}$; Molars, $\frac{1-1}{2-2} = 34$.

Pelage.— Adults: *Summer.* Upper parts and upper lip dark yellowish brown; chin white; under parts, inner sides of limbs, fore feet and under side of tail deep ochraceous yellow; tail above like body except for terminal half which is black. *Winter.* Everywhere white except for black pencil on tail. Pelage made up of two coats, long hard hairs and a shorter, softer coat of underfur.

Measurements.— Length, male, 15 inches; tail, 7 inches; hind foot, 2 inches. Females about one-seventh smaller.

Range.— Arctic coast and tundras.

Food.— Strictly carnivorous, principal diet mice, hares and small birds.

Remarks.— Nearly all the Weasels have the same general type of coloration and practically all found in regions of moderate to heavy annual snow fall turn white in winter; only those found in warm regions retain throughout the year the brown summer coat. This group is a large one and contains many forms differing from one another in color, size and internal structure. In all some thirty species and sub-species of Weasels are now recognized by the best authorities, but only a few of the more distinct and well-known species are listed below.

Related Species

Arctic Weasel.— *Mustela arctica arctica* (Merriam). One of the larger Weasels. See description above. Arctic coast and tundras.

Bonaparte's Weasel.— *Mustela cicognanii cicognanii* Bonaparte. Size small; tail short. Forested North America from New England and Labrador to coast of southeastern Alaska, south into Rocky Mountains to Colorado.

Richardson's Weasel.— *Mustela cicognanii richardsonii* (Bonaparte). Larger than Bonaparte's Weasel. Timbered belt from Hudson Bay to interior of Alaska and British Columbia.

Mountain Weasel.—*Mustela arizonensis* (Mearns). Similar to New York Weasel. Sierra Nevada and Rocky Mountains from Arizona into British Columbia.

Long-tailed Weasel.— *Mustela longicauda longicauda* Bonaparte. Size large, tail long. Great Plains from Kansas northward.

Cascade Weasel.— *Mustela saturata* (Merriam). Color dark. Cascade and Siskiyou Mountains of Oregon and Washington northward into British Columbia.

Yellow-throated Weasel.— *Mustela xanthogenys xanthogenys* Gray. Size large, white spot on head and between eye and ear. Sierra Nevada, southern California.

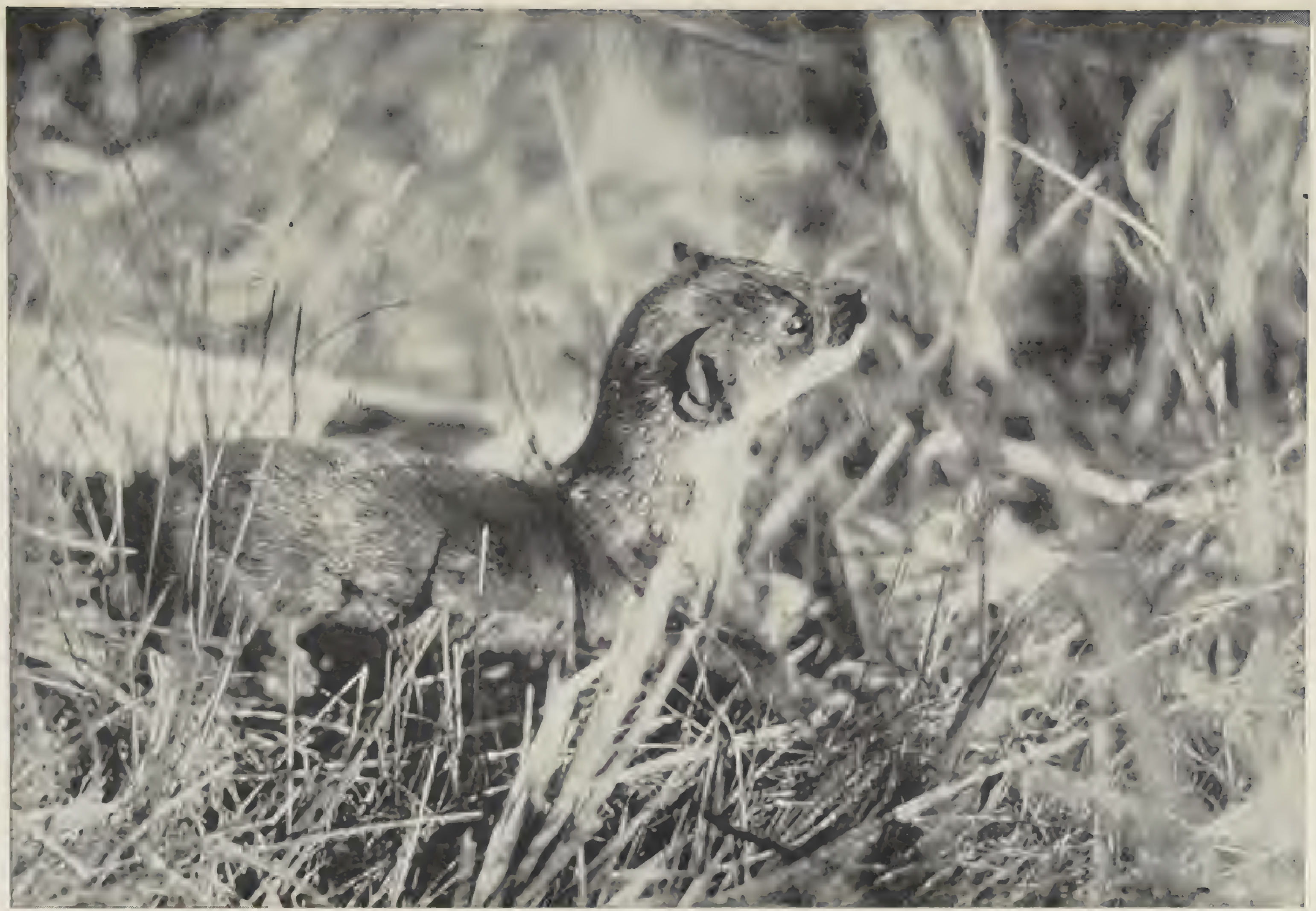
New York Weasel.— *Mustela noveboracensis noveboracensis* (Emmons). See description below.

Bridled Weasel.— *Mustela frenata frenata* Lichtenstein. See description below.

Least Weasel, or Pygmy Weasel.— *Mustela rixosa rixosa* (Bangs). See description below.

The Weasel tribe is numerous and widely distributed, both in this country and in Europe. It contains members differing greatly in size, color and structure. In size it ranges from the New York Weasel, about sixteen inches long, to the Pygmy Weasel, about seven inches. There are, in fact, some thirty species and sub-species now recognized, but the general habits are similar.

Wherever found, it is a bold and inquisitive animal, exhibiting but little fear of man, and poking out its nose from some hole or cranny with the greatest indifference and self-possession. In spite, however, of this curiosity, the Weasel is ever on the alert to withdraw its head at the slightest symptom of attack. Its normal gait is a series of small leaps, stopping at intervals to take a careful survey of its surroundings, and not unfrequently rising on its haunches to obtain



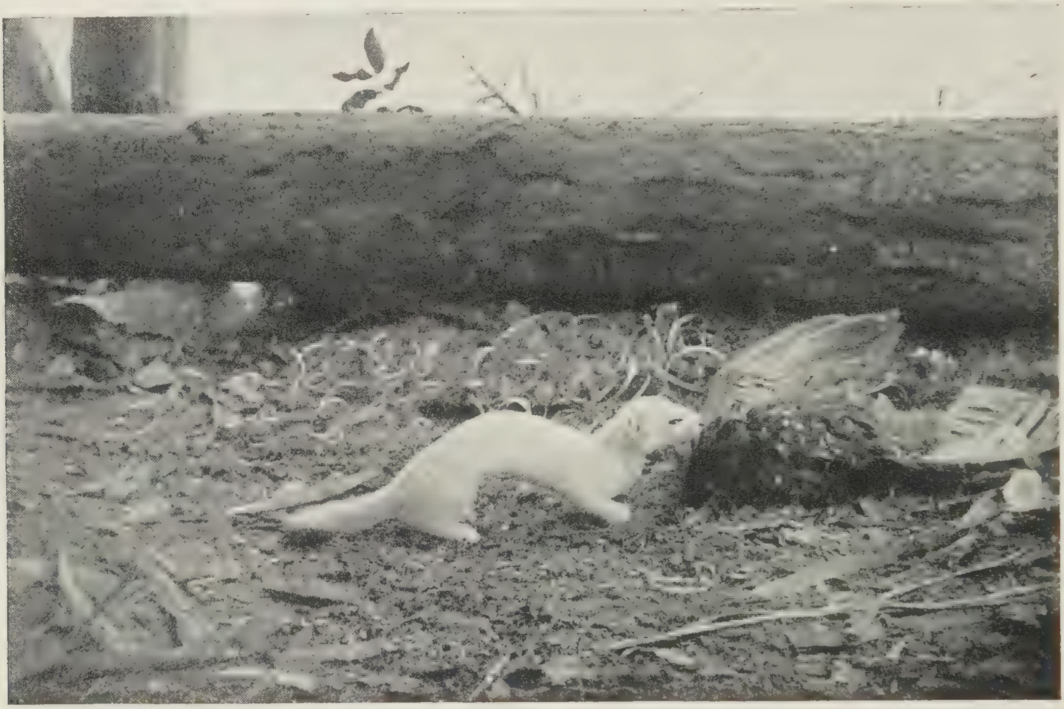
Photograph by William L. Finley

MOUNTAIN WEASEL

A species very similar to the New York Weasel, found in the Northwest. Photograph about one-half life size a better view. From its elongated, almost snake-like, body it can follow most of the small mammals on which it preys into their holes.

A graceful little bundle of muscle, combined with courage and cunning of a high order — such is the American Ermine, or Arctic Weasel, whose fur is so highly prized. Dr. Coues gives him a quality of courage and resourcefulness, far above the large carnivora: " No animal or bird, below a certain maximum of strength or other means of self-defense, is safe from his ruthless pursuit. The Ermine assails them not only upon the ground, but under it, and on trees, and in the water. Swift and sure-footed, he makes open chase and runs down his prey; keen of scent, he tracks them, and makes the fatal spring upon them unawares; lithe and of extraordinary slenderness of body, he follows the smaller animals through the intricacies of their hidden abodes, and kills them in their homes. And if he does not kill for the simple love of taking life, he at any rate kills instinctively more than he can possibly require for his support. I know not where to find a parallel among the larger carnivora."

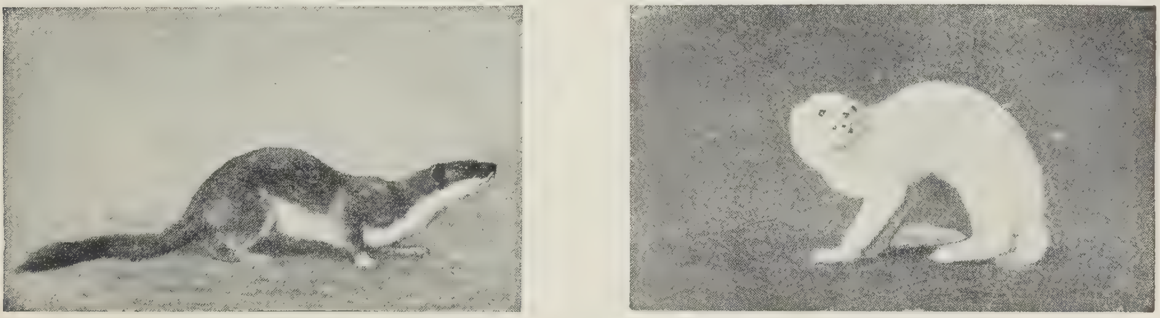
A glance at the Weasel suffices to betray its dominant traits. The teeth are almost of the highest known raptorial character; the jaws are worked by enormous masses of muscles covering all the side of the skull. The forehead is low, the nose sharp; the eyes are small, penetrating, cunning, and glitter with an angry green light. " There is something peculiar, moreover, in the way that this fierce face surmounts a body extraordinarily wiry, lithe and muscular. It ends a remarkably long and slender neck in such way that it may be held at right angle with the axis of the latter. When the creature is glancing around, with the neck stretched up, and flat triangular head bent forward, swaying from one side to the other, we catch the likeness in a moment. It is the image of a serpent."



ERMINE, OR ARCTIC WEASEL

A dominant trait of this beautiful fur-bearer is curiosity

Audubon, one of our earliest and most careful observers, thus describes the Ermine: "Graceful in form, rapid in his movements, and of untiring industry, he is withal a brave and fearless little fellow; conscious of security within the windings of his retreat among the logs, or heap of stones, he permits us to approach him within a few feet, then suddenly withdraws his head. We remain still for a moment, and he once more returns to his post of observation, watching curiously our every motion; seeming willing to claim association so long as we abstain from becoming his persecutor. Yet with all these external attractions, this little Weasel is fierce and bloodthirsty, possessing an intuitive propensity to destroy every animal and bird within its reach, some of which, such as the American rabbit, the ruffed grouse and domestic fowl, are ten times its own size. It is a notorious and hated depredator of the poultry house, and we have known forty well grown fowls to have been killed in one night by a single Ermine. We have traced the footsteps of this bloodsucking little animal on the snow, pursuing the trail of a fleeing rabbit, and although it could not overtake its prey by superior speed, yet the timid Hare soon took refuge in the hollow of a tree, or in a hole dug by the Marmot or Skunk. Thither it was pursued by the Ermine and destroyed, the skin and other remains at the mouth of the burrow bearing evidence of the fact."



TWO VIEWS OF THE ERMINE

Showing the summer and winter coats of an animal whose fur is greatly desired

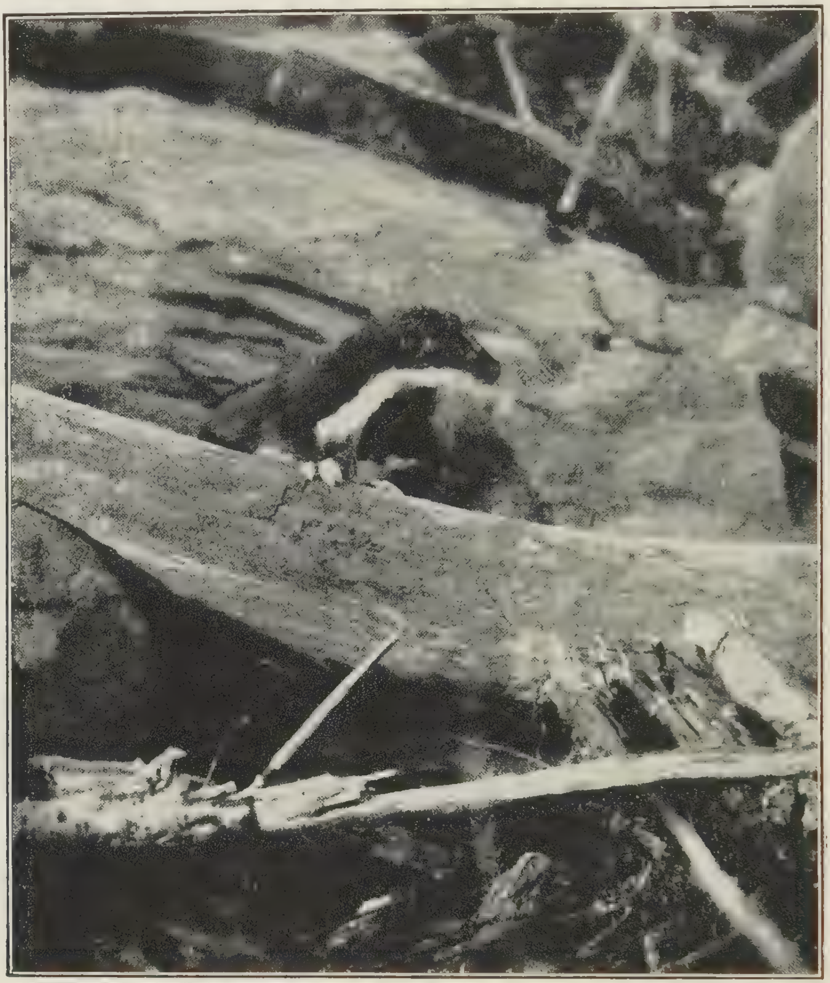
The Weasel can be employed, in the manner of a Ferret, in driving Rabbits from burrows. In one instance the Ermine employed had been captured only a few days before, and its canine teeth were filed, in order to prevent it destroying the Rabbit. A cord was placed around its neck to secure its return. It pursued the Hare through all the windings of its burrow, and forced it to the mouth, where it could be taken in a net, or by the hand.

The color of the fur in summer is of a reddish-brown above and sulphur-white below. In the northern latitudes the color change is very marked. In the late autumn the coat is shed very rapidly and replaced by a much longer and denser white one for winter, except the tip of the tail, which is black.

The nature of the change from the dark summer to the white winter dress has given rise to much discussion. It was originally considered that the animal sheds its coat in the autumn and spring; the dark summer coat being gradually replaced by the advent of the white hairs of the winter one. Doubts then arose whether the change in color was always coincident with the development of the winter and summer coat, and whether the hairs themselves might not actually change color. Dr. Coues succeeded, however, in proving that the change might take place in either way, some specimens taken in spring showing the long, woolly white winter coat on some parts of the body, while on other parts they had the short, coarse, brown hair of summer; and he observes that "we may safely conclude that if the requisite temperature be experienced, at the periods of renewal of the coat, the new hairs will come out of the opposite color; if not, they will appear of the same color, and afterwards change; that is, the change may or may not be coincident with the shedding." Dr. Coues attributed the reason of the color-change entirely to the effect of temperature; but strong objection is taken to this view by Dr. Merriam, who observes that it occurs in captive specimens kept continually in warm rooms. Dr. Merriam, however, states that the winter change never takes place till after the first fall of snow, which generally occurs towards the end of October or the beginning of November. Although the temperature of the air may be much lower before than subsequent to this first snowfall, yet it is true "that Ermine caught up to the very day of the first appearance of snow bear no evidence of the impending change. Within forty-eight hours, however, after the occurrence of the snowstorm the coat of the Ermine has already commenced to assume a pied and mottled appearance, and the change now commenced progresses to its termination with great rapidity. In early spring, the period for the reversal of this process, the changing back from its white coats of winter to the brown summer coat is determined by the same cause — the presence or absence of snow."

Like a majority of predatory animals, the Weasel is nocturnal in its habits. Nevertheless, it is too often abroad in the daytime, either in sport or on the chase, to be classed among the truly nocturnal animals. In the choice and construction of its retreats we see little evidence of burrowing instincts. It retreats beneath stone heaps in dense thickets, under logs and stumps, in hollow trees, and also in burrows, though these are usually those made by other animals that it has driven off or destroyed. Nevertheless, there is evidence that it sometimes digs.

Captain Lyon states that he observed a curious kind of a burrow made by Ermines in the snow " which was pushed up in the same manner as the tracks of moles through the earth. These passages ran in a serpentine direction, and near the hole or dwelling place the circles are multiplied, as if to render the approach more intricate." Audubon has a passage of similar effect: " We have frequently observed where it has made long galleries in the deep snow for twenty or thirty yards, and thus in going from one burrow to another, instead of traveling over the surface, it had constructed for itself a kind of a tunnel beneath."



Photograph by the U. S. Biological Survey

BONAPARTE'S WEASEL

The Weasel is a skilful climber, darting along the limbs of trees with the nimbleness of a Squirrel

NEW YORK WEASEL

Mustela noveboracensis (*Emmons*)

General Description.— See Arctic Weasel. One of the larger Weasels of the United States. Dark in color, in summer, and with a long tail, usually one-third entire length. Black tips.

Dental Formula.— Same as Arctic Weasel.

Pelage.— *Summer,* dull brown on upper side gradually shading into white on under side. *Winter,* pure white except tip of tail.

Measurements.— Male larger than female; length usually 16 to 18 inches for male, and 12 or 13 inches for female.

Range.— Eastern United States from Maine to Illinois.

Food.— Small mammals, birds, grasshoppers, and any other living flesh that it can secure. No vegetable matter.

One of the best known Weasels, because living near home to many Eastern people, is the New York Weasel. Its habits resemble other related species, one of its nearest relatives being the Mountain Weasel of the West. The New York Weasel is to be found from Maine to the Mississippi River. It is one of the larger types, being about sixteen inches long. It is dull brown in color above, and white below, changing to white in winter, except for the final one-third of the tail, which remains black.

Despite its destructive habits, this Weasel is rather a benefactor than an enemy to the farmer, ridding his granaries and fields of many prowlers. A mission appears to have been assigned to it by Providence to lessen the rapidly multiplying number of mice and the small rodentia. Wherever the Weasel appears, the mice for half a mile around rapidly diminish in number. Their enemy is able to force its thin vermiform body into the burrows, it follows them to the end of their granaries, and destroys whole families.

Dr. Coues thus observes: "We once placed a half-domesticated Weasel in an outhouse infested with Rats, shutting up the holes on the outside to prevent their escape. The animal soon commenced his work of destruction. The squeaking of the Rats was heard through the day. In the evening, it came out licking its mouth, and seemed like a hound after a long chase, much fatigued. A board of the floor was raised to enable us to ascertain the result of our experiment, and an immense number of Rats were observed, which, although they had been killed in different parts of the building, had been dragged together, forming a compact heap."

A better character, however, is given by a recent observer, Mr. S. A. Lottridge, who says: "I do not believe that the normal Weasel is as bloodthirsty as many would lead us to think, but rather his physical condition must answer for his superfluous killing. My experiments with Weasels extended over a period of several years. Under an old barn I had a Weasel house which was made mouse tight, a ground space ten by fifteen feet. Connecting with this by means of small doors were two other smaller compartments, also mouse tight. The house was fitted up as an ideal place for a Weasel's home: there were hollow logs, a stone pile, and plenty of dry leaves and moss. The experiments were tried at nightfall, as results were more quickly obtained, since the Weasel is largely nocturnal.

"In one of the experiments there were placed in one of the compartments an old rabbit and four small ones, and in the other compartment three chickens. Late in the evening the compartments were examined and not a rabbit or a chicken was found alive, and the remains had been left just where the victims had fallen. No attempt was made by this Weasel to hide the bodies for future use. The Rabbits were killed by a single bite, except the old one, which was bitten twice in the neck. The brains of two of the young rabbits were eaten. At another time, another Weasel killed six young rabbits and six chickens in a single night.

"In experimenting with several other Weasels the number of animals killed was large, except in two instances which I will cite later, but there was a marked difference in the number of brains consumed and the amount of flesh eaten. By regulating the food supply I found that the first choice was blood, next the brains, and then the flesh. Why this is the order I will attempt to demonstrate. By accident I discovered in the stomach of a Weasel a large parasite. As this was noted several times in other Weasels, it occurred to me that perhaps the parasite was the cause of such an abnormal ferocity and love for blood. I accordingly set about a definite investigation, with the result that out of twelve Weasels examined, I found but two without the parasites.

"At last a beautiful male Weasel occupied the house. On several occasions he left both chickens and rabbits in the compartments for two nights without killing them, and of ninety per cent of the animals he killed in six months portions of the bodies were eaten. Upon the dissection of this Weasel no parasite was found. Some time later another Weasel without the parasite behaved in the same manner. A Weasel which was trapped and brought to me dead had no parasite, but the stomach contained much solid food.

"I noticed with the Weasels having parasites that they were not in as fine a condition as those not having them. The fur in many cases showed a marked difference, being thicker and more glossy in those without the parasites. The length of the parasites varied from six to nine and a half inches. This seems to point to one conclusion, that the parasite in the Weasel's stomach is one cause for its choice of food and the blind ferocity that stamps the animal as a bloodthirsty little villain."

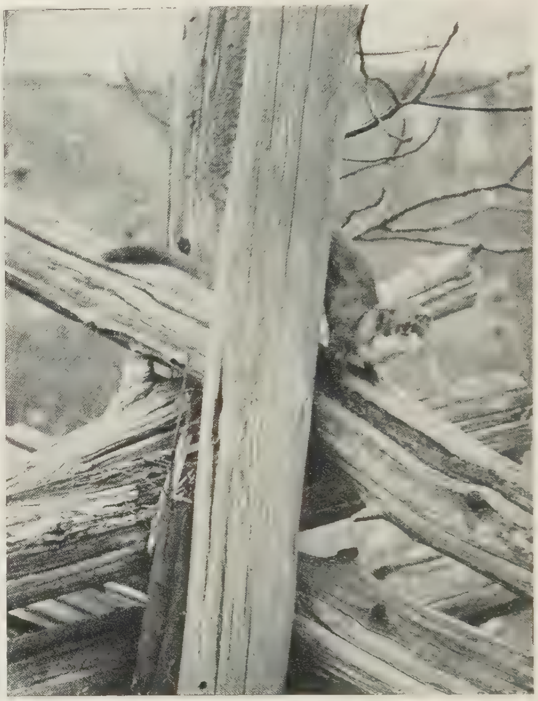
When angered the Weasel emits a penetrating and disagreeable odor, common to its family.

The mother Weasel's courage in defending her young against all odds is well known. The nest is constructed of dry leaves or moss in a stone heap, or log pile, or hollow log. There are two or three litters each year, with four or five young at a birth.

The young develop very rapidly and soon learn to shift for themselves. The following anecdote by an observer testifies to this fact: "I was walking through a park one day early in the autumn, when I noticed that the dead leaves under a tree were tossing and tumbling about in a curious manner. On going a little closer I found that a mother Weasel and her little ones were playing together. When I came up, of course, they all ran away. So I ran after them, and caught one of the little animals by putting my foot on it, just hard enough to hold it down on the ground without hurting it. And immediately the little creature, which was only about six inches long, twisted itself around, and drove its sharp teeth into the edge of the sole of my shoe, both from above and below. So that if I had done what I thought of doing at first and had stooped to pick it up, its teeth would certainly have met in my finger."

The Weasel is a skilful climber, darting along the limbs of trees with the nimbleness of a Squirrel. Not content with seeking its prey on the ground it will pursue birds through the trees.

Dr. A. K. Fisher says, "The Weasel is one of Nature's most efficient checks upon the hordes of meadow mice and other rodents, which at times destroy forage, crops, orchards, vineyards, and garden produce. It feeds also upon rabbits, squirrels, and birds, and in many sections its occasional inroads on the poultry yard have brought it into serious disrepute. It is, of course, desirable to kill particular individuals which have acquired the poultry habit, but farmers and horticulturists will make a mistake if they systematically destroy Weasels."



Photograph by H. T. Middleton

NEW YORK WEASEL

The Weasel's body is long, and its legs are set so far apart that they seem to work independently

The Mountain Weasel is tolerably common in the mountainous parts of the West, and replaces the Long-tailed Weasel from the eastern base of the foothills westward. It has a wide vertical range and occurs on both slopes of the Continental Divide from 5,000 feet to timberline.

It frequents the piles of large bowlders and debris in canyon bottoms and along mountain streams, where it preys chiefly upon Mice, Chipmunks, and Say Spermophiles. When surprised in the open, it immediately seeks refuge among the nearest rocks, but once in its safe retreat, its curiosity overcomes its fear, and it is seldom out of sight for more than a moment.

BRIDLED WEASEL

Mustela frenata *Lichtenstein*

General Description.— See general description for Arctic Weasel. Larger in size; tail longer and pattern of coloration distinctly different; color in general dark chestnut brown to black, with conspicuous white patch across forehead; below, ochraceous yellow to orange.

Dental Formula.— Same as given for Arctic Weasel.

Pelage.— ADULTS: Same pelage in winter as in summer. Top of head varying from dark chestnut brown to black; rest of upper parts rich brown; band across forehead including eyes and extending back to ear white; chin and throat whitish; rest of under parts ochraceous yellow to orange; front feet to above wrists whitish yellow to orange; inner sides of hind legs and hind feet yellow or orange; tail like back above and below, with restricted black tip.

Measurements.— Male, 18 to 20 inches; tail, 7 to 8 inches; hind foot, 2 inches.

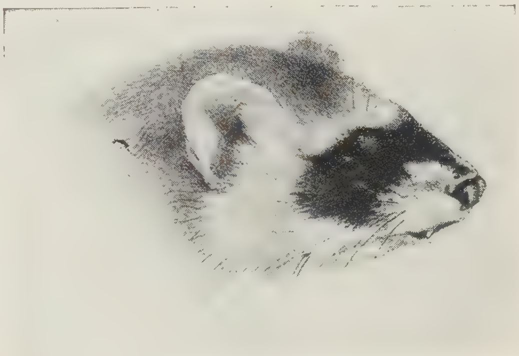
Range.— Southern Texas into Mexico.

Food.— Small mammals and birds, anything that it can capture.

The Bridled Weasel lives at the other extreme of our country from the Ermine. While the latter ranges from the Canadian border to the Arctic coast, thus deriving its name of Arctic Weasel, the Bridled Weasel is found principally along our southern border and in the interior of Mexico.

It is a handsome little beast with tawny coat, as befits its life in a warmer zone, but it apparently has lost none of the activity of its northern cousin. The coat is a rich chestnut, shaded with dull brown or black, and, unlike the northern varieties, it does not turn white in winter. Where it lives, with winter almost devoid of snow, there is no need of this change, and Nature does not believe in doing useless things.

The Bridled Weasel is about eighteen inches long, sometimes longer, and is thus one of the largest species. Like other Weasels it is bloodthirsty, pursuing rodents and birds relentlessly. It pays no attention to other food, and is especially noted for its ferocity. Indeed, if such Weasels were of larger size they would be among the most dreaded of animals.



By permission of the U. S. Biological Survey

BRIDLED WEASEL

Drawing of head, showing characteristic markings from which this animal gets its name

LEAST, OR PYGMY WEASEL

Mustela rixosa *(Bangs)*

General Description.— See Arctic Weasel. Smallest of the Weasels and smallest living carnivore. Tail without black tip and very short.

Dental Formula.— Same as Arctic Weasel.

Pelage.— *Summer,* upper parts reddish-brown, lower parts, white. *Winter,* entirely white.

Measurements.— Males, 7 inches long; females, 6 inches long.

Range.— Arctic America from Alaska to Hudson Bay, and south to Minnesota and Montana.

Food.— Strictly carnivorous. Small mammals and birds wherever found.

The Pygmy, or Least Weasel, is so-called because it is the smallest of the Weasels and the smallest of all flesh-eating mammals. Because of its flesh diet it is exceedingly fierce, being known to attack animals nearly twice its size without provocation.

The Pygmy Weasel is only seven inches long, or less. In color it is reddish brown on the back and white on the belly. In winter it is entirely white. Its tail lacks the usual black tip which marks the Ermine. It ranges over the greater part of Canada from the coast of Alaska to Hudson Bay, and south as far as Minnesota and Montana.

Its white coat in winter coupled with its diminutive size makes it extremely hard to follow through the snow. An observer says: "One would suppose that this beautiful white fur of winter, literally as white as the snow, might prove a disadvantage at times by making its owner conspicuous when the ground is bare in winter, as it frequently is even in the North; yet though Weasels are about more or less by day, you will seldom catch so much as a glimpse of one at such times, though you may hear their sharp chirrup close at hand. Though bold and fearless, they have the power of vanishing instantly, and the slightest alarm sends them to cover. I have seen one standing within reach of my hand in the sunshine on the exposed root of a tree, and while I was staring at it, it vanished like the flame of a candle blown out, without leaving me the slightest clue as to the direction it had taken. All the Weasels I have ever seen, either in the woods or open meadows, disappeared in a similar manner. How hawks, owls or foxes ever succeed in catching them is a mystery, yet they do from time to time, though certainly not often enough to reduce the number of Weasels at any season."

Mr. D. Costello relates an incident which occurred many years ago while he was prospecting in the mountains of northern Gunnison County, Colorado, back of Crested Butte. Soon after locating in a cabin adjacent to a large rock slide just below timberline, he discovered that a Cony was occupying a large grass nest beneath the cabin floor. It often appeared in the cabin, coming up through a broken board in the floor, and in time became very friendly. Finally a day came when the Cony did not make its usual appearance, but a tiny Weasel was seen at the hole in the broken board, peering in all directions and craning its long slim little neck with the bold curiosity so characteristic of the larger Weasels. Fearing for the welfare of the Cony, Mr. Costello killed the tiny cut-throat, but apparently too late, as he saw no more of his interesting companion. It seems probable that the Cony is often preyed upon by this Weasel, as the same rock slide has frequently been found to harbor both animals.

BLACK-FOOTED FERRET

Mustela (= Putorius) nigripes (*Audubon and Bachman*)

General Description.— Largest of the Weasel group. See general description of Arctic Weasel. Form like that of Arctic Weasel, but much larger in size, and body proportionately heavier; muzzle short; ears short, broad at base, closely furred; tail about ⅓ length of head and body; color above, reddish-brown; below, white; end of tail black.

Dental Formula.— Same as that given for Arctic Weasel.

Pelage.— Adults: No seasonal variation. Color above, rather reddish-brown with a dark area along the back and with hairs white at the roots; underfur white, tinged with yellow, showing through the brown hairs to give a buffy appearance; sides and rump lighter fading to yellowish-white; nose, ears, sides of head, throat and under surface of neck, belly and under surface of tail white; chest between fore legs brownish; a broad black patch on forehead inclosing eyes and reaching tip of nose; legs to shoulders and to hips brownish black; terminal two inches of tail black.

Measurements.— Length, male, 19 inches; tail, 4 inches; hind foot, 2½ inches. Female, length, 18 inches.

Range.— Great Plains from western North Dakota and northern Montana south to Texas.

Food.— Small mammals, but principally Prairie Dogs and probably a few small birds.

The Black-footed Ferret is a true Weasel, but differs from the other members enough to be placed in a group by itself. Its characteristic markings, the bright yellowish tone of the upper parts, the black across the face and the black feet, together with its large size, are sufficient to enable it to be instantly separated from any of its kindred. It does not change color in winter. There is but the one species known, a pretty little animal living out in the Western States in the Rocky Mountain country.

In 1849 it was described and pictured by Audubon and Bachman, but soon afterward naturalists seemed to lose sight of it, for little more was heard of it for thirty or forty years.

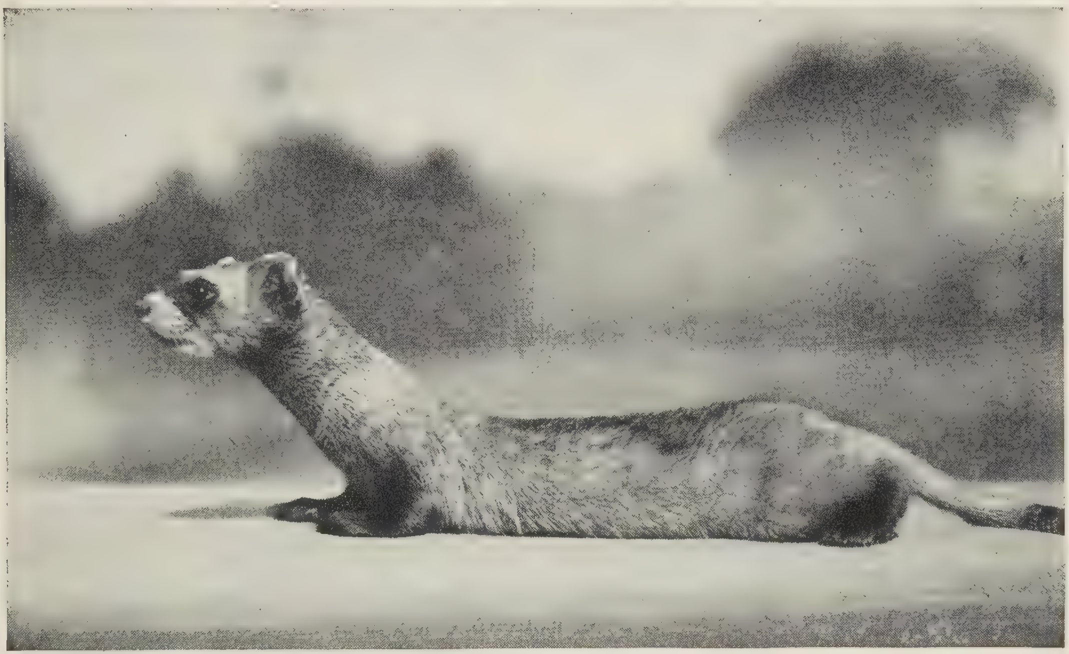
Locally it is known as the Prairie Dog Hunter, or Prairie Dog Ferret, as it seems especially fond of that fat little beast — much, however, to the latter's distress. It is most often found in the holes of the defunct Dogs upon which it has feasted.

Very little is known as to the habits or life history of this animal, which seems chiefly remarkable for its ability to escape observation. Like all of the Weasel clan it is strictly a flesh-eater. There are no Fridays on its church calendar and no vegetarians among its friends. Failing in its supply of Prairie Dog steak, it assiduously hunts the Field Mice and other small mammals, as well as birds and their eggs.

Mr. Merritt Cary, in "A Biological Survey of Colorado," says: "This rare and little known animal has been recorded from a number of localities on the plains of eastern Colorado, but here, as elsewhere over its range, its numbers are small. Usually it is found in Prairie Dog towns, where it takes up its abode in an abandoned burrow, and from this convenient base preys upon the defenseless inhabitants of the colony. These Ferrets are most beneficial mammals, because their prey consists largely of Prairie Dogs."

Two specimens were captured at a height unusual for this plains mammal. Warren says: "One specimen in my collection came from Divide, Teller County, at an elevation of 9800 feet, another was found dead in Lake Moraine, El Paso County, altitude 10,250 feet. It is a mystery how the animal came there, and when skinned there were no marks on its body to indicate the cause of death."

Others have been recorded by Coues. All were taken in Prairie Dog towns, and one specimen had been drowned out of a Prairie Dog hole and captured alive. This individual was kept in confinement for some time. "It became quite tame, readily submitting to be handled, though it was furious when first caught. It was kept in a wire cage and fed on beef. When irritated it hissed and spat like an angry cat. It used to hide by covering itself over with material of which its nest was composed, but at times, especially at night, it was very active and restless."



By permission of the New York Zoological Society

BLACK-FOOTED FERRET

A member of the Weasel family that is little known because of its elusive habits. It is sometimes found in Prairie Dog burrows

AMERICAN MINK

Mustela vison *Schreber*

General Description.— Body Weasel-like; heavier and considerably larger than a Weasel; legs short; head broadly triangular in shape; tail about ⅓ length of body, bushy; ears short; soles hairy; foot pads naked; five toes in front and behind. Females considerably smaller than males. General color dark brown.

Dental Formula.— Same as that given for Weasel.

Pelage.— ADULTS: No marked seasonal variation. Pelage is composed of a long outer coat formed of hard, lustrous hairs and a shorter denser coat of soft under hairs dark in color like the longer coat but generally lighter in tone; above, nearly uniform umber brown, darker and glossier on the back, and on the tail, becoming nearly black; chin more or less white, and occasionally irregular white spots on throat, breast or belly. YOUNG: Not quite as dark as adults and at first lacking the long shining hairs of the outer coat.

Measurements.— Length, male, 24 inches; tail, 7 inches; hind foot, 2½ inches. Weight, 2 pounds. Females, smaller; weight, 1 pound 10 ounces.

Range.— Central North America from eastern Canada to the Rockies.

Food.— Small mammals, birds and their eggs, fish, crayfish, mussels and clams.

Remarks.— The Mink seems to be midway in its development between the Weasel and the Otter, having a good many characters in common with either animal. The Minks of North America have not become differentiated into as many different forms as have the Weasels, and the Mink from Florida has almost precisely the same appearance as has the one from Alaska, there being only a slight size and color difference. About ten species and sub-species are known.

RELATED SPECIES

American Mink.— *Mustela vison vison* Schreber. The typical animal of the above description. From eastern Canada to the Rocky Mountains through central North America.

Western Mink.— *Mustela vison energumenos* (Bangs). Larger and darker than the American Mink. Western North America from northern California to Arctic regions and east to Saskatchewan.

Alaska Mink.— *Mustela vison ingens* (Osgood). Very large and rather dark. Alaska.

Florida Mink.— *Mustela lutensis* (Bangs). Smaller than American Mink, tail shorter; color paler, more yellowish. Florida.

In both Europe and America, the Mink is semi-aquatic, being commonly at home in districts where water is found. In its water-loving propensities, it may be regarded as bearing the same relationship to the Polecat as is held by the Water-Vole to the Land-Vole. "The Mink," writes Dr. Merriam, "not only swims and dives with facility, but can remain long under water, and pursues and captures fish by following them under logs or other places from which there is no escape. It has thus been known to catch as swift and agile a fish as the brook-trout, and Audubon says that he has seen a Mink catch a trout of upwards of a foot in length. It is remarkably strong for so small an animal, and a single one has been known to drag a mallard duck more than a mile, in order to get to its hole, where its mate joined in the feast." Generally, the food of the Mink consists of various aquatic creatures, such as frogs, crayfish, and molluscs; but it will also eat various small aquatic mammals, such as voles, as well as mice and rats. Marsh-frequenting birds also fall victims to the Mink, and their eggs are probably also consumed. Other wild birds are, however, comparatively safe from the attacks of this animal, as its climbing powers are of the feeblest. Poultry are not unfrequently attacked; but in these and other attacks the Mink does not exhibit that wholesale destructiveness characteristic of the Ermine. In hunting, the Mink has been often observed to pursue its prey entirely by scent; and it may be observed on its hunting expeditions both by night and by day.

As a rule, Minks appear to be comparatively solitary animals; rarely are more than two seen in company. The abode of the Mink is usually a hole in the bank of a stream or lake; and a well-trodden path always leads from the entrance of the burrow down to the water. From such abiding places the animal will not only make daily excursions for the sake of procuring food, but also wander into neighboring districts, from which it sometimes does not return till after the lapse of a week or two.

Minks have been extensively bred in captivity for the purpose of being used as Ferrets, and in this condition it appears that the number of young in a litter may vary from three to as many as ten. The scent characteristic of all the members of the Weasel group is extraordinarily developed in the Mink, Dr. Coues observing that no animal, with the exception of the Skunk, possesses such a powerful, penetrating and lasting effluvium.

All who have hunted the Mink bear witness to its extraordinary tenacity of life, the writer last quoted stating that he has known several instances of these animals being found alive after having lain for fully four-and-twenty hours with their bodies crushed flat beneath a heavy log. The countenance of the Mink is described as at all times far from prepossessing; but when alive in a steel-trap, these animals are said to have an expression almost diabolical.

A recent writer narrates an incident showing that the Mink is a formidable enemy of the Musk-Rat, though yielding to the latter in weight. While snipe-hunting on a marshy island below the Kickapoo Rapids of the Illinois River, the writer noticed an object, which appeared like a ball some six or eight inches in diameter, rolling toward the water. It was a Mink and a Musk-Rat clinched together, and so completely covered with mud as not to have been at first recognized. At his approach, the Mink released its hold and made its escape; but the Musk-Rat was already dying of severe wounds in the head and neck, from which the blood was flowing profusely. The rodent had evidently been captured and overcome in fair fight by broad daylight, and the Mink would have devoured its victim had not the hunter interfered.

Mr. Charles Hallock remarks that he has known Minks to carry off fish weighing no less than twelve pounds: "We were spending our vacation in the woods of Maine, fishing and traveling about for a good time in general. One day we came across an old dam made to flood a piece of lowland. As this looked like a good place to fish we stopped, seated ourselves upon the edge of the dam, and cast in our line. The fish were quite plenty, and as soon as we caught one we threw it behind us upon the scaffolding. After a dozen or so had been caught, I thought I would light my pipe, pick up the fish and put them in the shade, and I started to do so. I accomplished the first object, but upon looking for the fish I could not find a single one. I thought that my chum must have removed them, and was playing a joke upon me, but on mentioning it to him, he was as much surprised as I was. They could not have fallen through the cracks, nor leaped over the side without our knowing it. Where were they? That was the question. He returned to fish, and I seated myself upon the bank to digest the subject. Presently he caught another fish and threw it upon the boards. Immediately I saw a Mink run out from a hole near by, snatch the fish and carry it off. This explained the mysterious disappearance of the others."

"The movements of the Mink on land," says Coues, "though sufficiently active, lack some-

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MINK

The Mink swims and dives with ease, hunting fish, frogs and other aquatic food. It is also fond of birds' eggs, but its climbing powers are feeble

thing of the extraordinary agility displayed by the more lithe and slender-bodied Weasels, as a consequence of the build of its body; while, for the same reason, it does not pursue the smaller animals into their extensive underground retreats, nor so habitually prowl about stone heaps and similar recesses. It is altogether a more openly aggressive marauder, though not less persistent and courageous in its attacks. It appears to be more perfectly at home in the water, where it swims with exactly the motions of an Otter, and in fact appears like a small specimen of that kind. It swims with most of the body submerged — perhaps only the end of the nose exposed — and progresses under water with perfect ease, remaining long without coming to the surface to breathe."

The Mink is not properly a migratory animal. In most sections it remains permanently where it takes up its abode. In others, however, it may be forced to remove at times, owing to scarcity or failure of its food-supply, such as may ensue from the freezing of the waters in northern parts. Under such circumstances, it may perform extensive journeys overland. Trappers speak of a "running" time with the Minks, but this probably refers to the time when the animals are hunting mates.

The mating season begins early — generally in February — and April is for the most part the month of reproduction. Five or six young are ordinarily produced at a birth, and the young remain with their mother through the summer. Litters have been found in the hollow of a log, as well as in the customary burrows.

The Mink has been frequently tamed, and is said to become with due care perfectly gentle and tractable, though liable to sudden fits of anger, when no one is safe from its teeth. Without showing special affection, it seems fond of being caressed, and may ordinarily be handled with perfect impunity.

Minks are not burrowing animals in a state of nature, but freely avail themselves of the holes of Musk-Rat and other rodents. They cannot climb a smooth surface, but ascend readily where there is roughness enough for a nail-hold. Tame Minks make excellent ratters, hunt vigorously, and soon exterminate the troublesome pests. Rats will make off on scenting them; they are so bewildered in flight that they give no battle, but yield at once; and the Mink severs the main vessels of the neck so quickly and skilfully that an observer would scarcely imagine the deed had been done.

Dr. A. K. Fisher says: "The Mink feeds on fish, crayfish, mussels, bats, and like the Weasel is indefatigable in its search for meadow mice and other marsh-loving rodents. It is very fond of Musk-Rats, and one of its most important services to man is the destroying of these pests about milldams, canals, and dikes, where their burrows undermine the embankment and cause disastrous overflows. The Mink, although semi-aquatic, sometimes travels long distances from water in search of rabbits, ducks and chickens. When it finds an unprotected poultry house, it sometimes contents itself with a single victim; but other times it kills all the inmates within reach. A single Mink has been known to kill thirty to forty ducks or chickens in one night. Fortunately such occurrences are rare and certainly will become less frequent, since the demand for Mink fur is constantly increasing."

LARGE STRIPED SKUNK

Mephitis mephitis (*Schreber*)

General Description.— A large robust-bodied animal as large as a cat, with pelage of clear black and pure white. Body thick-set; legs rather short; tail bushy; claws curved; ears short; anal musk glands exceedingly well developed; soles nearly wholly naked, partly plantigrade; color black all over, with the exception of broad white stripe from head along back and onto tail; white line down forehead to nose.

Dental Formula.— Incisors, $\frac{3-3}{3-3}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{3-3}{3-3}$; Molars, $\frac{1-1}{2-2} = 34$.

Pelage.— Adults: Sexes similar and no seasonal variation. Pelage composed of two types of hairs, long hard hair and short soft underfur. Color everywhere black, but with broad white band commencing at crown of head running backward, at first as one stripe, then dividing back of shoulders into two stripes along the upper side and continuing thus out along sides of tail; a narrow white stripe from middle of nose to crown; black hairs of tail white at base; tail white at tip. Young: Striped like adults.

Measurements.— Sexes about the same. Length, 24 inches; tail, 8 inches; hind foot, 3 inches. Weight, 7 to 8 pounds.

Range.— Eastern Canada west and north to Keewatin.

Food.— Small mammals, birds, insects, frogs, crayfish and snakes.

Remarks.— The Striped Skunks of the genus *Mephitis* range over nearly all of North America south of Hudson Bay and from coast to coast. They are readily distinguished from the Little Spotted Skunks of the genus *Spilogale* by their large size and by the quite different color pattern, the broad white stripes of the

Photograph by H. T. Middleton

HUNTING FOR TROUBLE

An adventurous Irish terrier is making the acquaintance of two Eastern Skunks

Mephitis group being a good diagnostic character. There is a wide range of individual variation in coloration, some animals having the white stripes very broad and prominent, others being nearly all black. About 15 species and subspecies are known from the region under discussion. Many of the characters upon which the species are based are to be found only in the skull.

RELATED SPECIES

Large Striped Skunk.—*Mephitis mephitis* (Schreber). Typical animal described above. Eastern Canada.

Hudsonian Skunk.—*Mephitis hudsonica* (Richardson). Larger; tail heavy and with no white tip. Western Canada from Manitoba to British Columbia, south to Colorado, Nebraska and Minnesota.

New England Striped Skunk.—*Mephitis putida* Boitard. Size medium; tail longer than that of *Mephitis,* tip white. New England and Middle Atlantic States, south to Virginia, west to Indiana.

Florida Striped Skunk.—*Mephitis elongata* (Bangs). Florida to North Carolina and West Virginia, west on Gulf coast to the Mississippi.

Southern Striped Skunk.—*Mephitis mesomelas mesomelas* Lichtenstein. Size very small; tail short, generally all black. Mississippi Valley from southern Louisiana to Missouri, westward into Texas.

Arizona Striped Skunk.—*Mephitis estor* Merriam. Black stripe on back narrow, tail with white tip. Arizona, New Mexico and eastern California.

Western Striped Skunk, or California Skunk.—*Mephitis occidentalis occidentalis* Baird. Wide lateral stripes not extending far onto tail; hairs of tail white on basal half. California in central and southern part, and southwestern Oregon.

Puget Sound Skunk.—*Mephitis occidentalis spissigrada* (Bangs). Skull narrow; tail long. Puget Sound and coast region of Washington, and northern Oregon.

Mearns Hooded Skunk, or Northern Hooded Skunk.—*Mephitis macroura milleri* (Mearns). Size medium. A member of a subgenus *Leucomitra* that differs from the other Striped Skunks in having dorsal stripe continuous along back, not forked. A group of southern distribution, Mexico. It reaches the United States only in Southern Arizona.

Photograph by S. A. Lottridge

STRIPED SKUNK

This pretty animal appeals to the sense of sight, if not of smell. Its handsome fur is a valuable commercial commodity

The Striped Skunk is among the handsomest animals of the fields, but being a wanderer of the night, he is not so frequently seen as the Squirrel or Woodchuck. However he is not strictly a nocturnal animal and may be found wandering about the fields in broad daylight, by the unwary.

The Skunk, like many other animals, is known in different localities by special names, such as "wood-pussy," "essence-peddler," and "polecat." Unlike most other animals, it has increased rather than decreased in numbers in the rural districts, for civilization has diminished its natural enemies and increased the food resources.

It is perfectly fearless of man and other animals, and if allowed to go its way undisturbed, will pass close to you with a genteel and dignified indifference, attending strictly to its own business; but, if interfered with or followed closely or suddenly alarmed, it will prepare for self protection, and woe to the man or animal insisting on disturbing it too much. Such implicit confidence has the animal in its own ability to defend itself that it wanders about as boldly as though lord of all it surveys.

That which particularly distinguishes the Skunk from other animals is its means of defense, which is a musky secretion having a most powerful and disagreeable odor. In addition to its terrible odor, the fluid is so intensely acid that it burns the skin like fire. In extreme cases such a discharge has been known to produce blindness. The fluid is yellow in color, somewhat phosphorescent, and resembles musk in its extraordinary volatility. The discharge at any one time is scarcely three drops, yet this small quantity will perfume the air for a half mile or more in every direction. The fluid or secretion employed by the Skunk in protecting himself is stored in two glands located under the tail, and may be ejected by muscular contraction to the distance of about ten feet. The contents of the glands are discharged, probably one or both at a time, as the occasion demands, in the form of a very fine spray. When the Skunk is facing you there is no danger that he will discharge his artillery. It is only when he turns tail toward the enemy that there need be alarm. Many believe that the Skunk scatters the essence with his tail, but this is entirely incorrect, for the Skunk is a very cleanly animal, and during the discharge the tail is arched high above the back to keep it undefiled. If he were to wet his tail with the essence, he would attract many enemies in the vicinity, and without doubt it is a matter of both prudence and comfort for him to remain free from the stench. The Skunk is provided with a special apparatus for discharging the fluid, which is connected with the ducts leading from the glands, and the apparatus is ejected a short distance from the end of the digestive tract when the essence is to be delivered. This arrangement easily explains the absence of the odor on the Skunk immediately after using its weapon of defense.

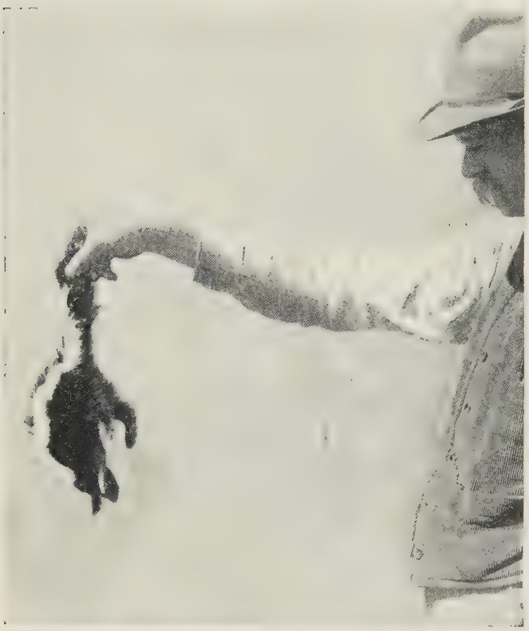
Skunk fur has always been in demand, and for several years past the price has greatly increased. The black fur is the more valuable, but the coloring of fur is now so largely practiced that it makes little difference how much white there is, for the skins all go through the dye to make them uniform in color. After dyeing, cutting, and making, few suspect that the fashionable "Alaska Sable" furs in our city shop windows come from little bicolored animals, called "wood-pussies" by the country folk.

STRIPED SKUNK

The Skunk, like the Porcupine, is fearless of other animals and man, for it knows that its natural weapons will cause it to be left undisturbed

The home of the Skunk is usually in a burrow in the forest which it digs with its powerful claws, but it may also take possession of a deserted Woodchuck's burrow, a cave, hollow log, or a stone wall. The den contains a large bed of grass and leaves, and here the young are born in the spring. When the young are about a quarter grown, they follow the mother on night excursions in search of food, and while moving from place to place they go in single file, forming a line fifteen to twenty feet in length. The young may be captured in the following manner: The would-be captor takes his place behind the line, and noiselessly approaches the rear Skunk, lifting it quickly from the ground by the tail. This may be nervous work for the novice, but is entirely safe, for when a Skunk is thus lifted from the ground the power of spraying the essence is apparently lost. It takes a steady nerve to approach an old Skunk and lift it by the tail, and although I have heard of several instances, I have but once actually seen it accomplished.

If the young are captured while small and are constantly handled and petted, they show a considerable degree of affection, and at times are very playful. Dr. C. Hart Merriam tells the following story about one of his Skunks, "Meph": "His nest was in a box at the foot of the stairs, and before he grew strong enough to climb out by himself, he would, whenever he heard me coming, stand on his hind legs with his paws resting on the edge of the box, and beg to be carried upstairs. If I passed by without appearing to notice him, he invariably became much enraged and chippered away at a great rate, stamping meanwhile most vigorously. During the evening he occasionally assumed a playful mood and would steal softly to my chair, and, standing erect, would claw at my pants once or twice and then scamper off as fast as his little legs could carry him, evidently anxious to have me give chase. If I refused to follow, he was soon back, ready to try some new scheme to attract my attention."



Photograph by W. L. Finley

A NERVE TESTER

Hold a Skunk by the tail and he is harmless — that is, if you get there quickly enough

Skunks have no way of expressing their joy, like the cat or dog, for the young and old alike are nearly voiceless, with the exception of an occasional little squealing or grunting noise.

The Skunk lives upon animal food, but in summer it is largely made up of insects, in particular grasshoppers. The number of insects a single one will destroy is beyond comprehension. The Skunk is one of the most efficient aids of the agriculturist, yet, when he takes up his abode under the barn, there is sure to be trouble among the fowls unless they are well housed, the greatest loss being among chickens. The mother hen may have a dozen little ones tucked away at night under protecting wings, and before morning a skillful paw may remove half the number, or more, leaving only the slightest trace of their unhappy end. The location of the mother hen and her remaining chickens must be changed, for Mr. Skunk will continue his nightly visits until the whole family is devoured. Other domestic fowls suffer in much the same way from such depredations. The ground-nesting birds probably pay a heavy tribute, both in eggs and in young, to this robber of the poultry yard. The few chickens he may destroy (not one Skunk in 500 ever tastes chicken) is small compensation for the destruction of field mice, beetles, and various forms of vermin, yet he is killed by the average farmer, whose prejudice is only exceeded by his ignorance of this most beneficial animal.

Again, the Skunk is particularly valuable in the hop regions, where he hunts the large grubs so destructive to the hop-roots. On a spring morning as you pass through the hop-yard you may notice numerous holes about the hop-hills. These indicate the industry of the nocturnal visitor.

There is a general belief that the Skunk hibernates during the winter. It does hibernate, but the period of hibernation is not as continuous or deep as in the case of many animals. The period of rest is broken several times during the winter, whenever the weather becomes mild for two or three days at a time. This season of inactivity becomes more pronounced the farther north we go, but the *degree* of it corresponds with the severity of the weather.

S. A. Lottridge.

LITTLE SPOTTED SKUNK

Spilogale putorius (*Linnaeus*)

General Description.— A strikingly marked black and white carnivore rather smaller than a small cat. Form moderately thick-set; head broadly triangular; ears small; tail long, bushy, with very long drooping hairs; anal musk gland well developed; naked pads at base of toes four in number on both fore and hind feet; coloration strongly contrasting black and white; hair everywhere long, the outer hairs hard and glistening, with an underfur of short soft hairs.

Dental Formula.— Incisors, $\frac{3-3}{3-3}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{3-3}{3-3}$; Molars, $\frac{1-1}{2-2} = 34$.

Pelage— ADULTS: Sexes similar. No seasonal variation. Color above and below, black with clear white markings distributed as follows: four white stripes along the dorsal region from the ear to about middle of back, then continuing as irregular spots or bands down almost to base of tail; a white stripe commencing just behind fore leg and extending backward parallel with stripe above, and finally curving up towards the back, just beyond the end of the white stripe above it; white spot upon the hip, a white spot on forehead between eyes, end of tail white. This pattern remains fairly constant for individuals, but there is some variation in the width and continuity of the white stripes. YOUNG: Spotted and marked like adults.

Measurements.— Length, 18 to 22 inches; tail, 7 to 8 inches; hind foot, 2 inches. Sexes about the same.

Range.— Virginia to Georgia, westward to eastern Arkansas and Missouri, north to western Kentucky, southern Illinois and southern Indiana.

Food.— Small mammals, birds and their eggs, and some insects.

Remarks.— The Spotted Skunk and its relatives of the genus *Spilogale* are the smallest of the North American Skunks. In some parts of the country, more particularly in the southwest, the skunks of this group have earned for themselves the name of "Hydrophobia Skunks" because of the idea that their bite carries hydrophobia. Considerable individual variation in the extent of the white markings and the number of different species and subspecies described, together combine to confuse the layman who would try to distinguish between the different kinds of this small skunk. About 13 different forms are listed north of the Rio Grande. A few of the more widely different varieties are given.

RELATED SPECIES

Little Spotted Skunk.— *Spilogale putorius* (Linnaeus). The typical animal. See description above. Georgia, western South Carolina, Alabama, Mississippi northward along the Alleghenies to northern Virginia, westward at least to Illinois.

Florida Spotted Skunk.— *Spilogale ambarvalis* Bangs. Size small; white markings prominent; tail short. Eastern portion of peninsular Florida.

Rafinesque's Spotted Skunk, or Prairie Spotted Skunk.— *Spilogale interrupta* (Rafinesque). White stripes more broken and with less white; tail entirely black or with only a few white hairs. Iowa, southern Minnesota, Nebraska, Kansas, Missouri and Oklahoma south to east central Texas.

Texas Spotted Skunk.—*Spilogale indianola* Merriam. Similar to Prairie Spotted Skunk, but tail white for about ⅓ of its length. Coast region of Texas.

Arizona Spotted Skunk.— *Spilogale arizonae* (Mearns). Principal characters of difference to be found in the skull. Central and southern Arizona, western New Mexico.

Rocky Mountain Spotted Skunk.— *Spilogale tenuis* Howell. Terminal third of tail white; cranial differences separating it from other members of the genus. Rocky Mountains in Colorado and New Mexico.

Western Spotted Skunk—*Spilogale phenax* Merriam. White markings on body very extensive, much white on tail. California.

Mearns's Spotted Skunk.— *Spilogale ambigua* Mearns. White spots small; size small; body slender. Central Arizona south.

Desert Spotted Skunk.— *Spilogale gracilis gracilis* Merriam. Similar to Western and Mearns's, but slender. Northern Arizona and southeastern California.

Although its coat is differently marked from that of its striped cousin, the Spotted Skunk is not essentially different in habits. It is the same unconcerned animal going serenely on its way, in the knowledge that it will be given a wide berth. This variety also is widely distributed in America, but is much more common in the West than in the East. It is a graceful, beautifully marked animal, with spots alternating with stripes. However, in the furrier's hands its fur is usually dyed a uniform black, and for this reason its natural markings are unfamiliar.

Some species of the Spotted Skunk have been called Hydrophobia Skunk, from the widely prevalent idea that their bite produced madness. This topic has been debated at length, but as yet no very definite conclusions have been reached as to whether man and some of the higher animals develop hydrophobia when bitten by the Skunk. This may or may not be true, all depending upon circumstances. The bite of the Skunk is no more to be feared than that of other animals such as the fox or dog, but it should be remembered that blood-poisoning may follow, and it may not be due to rabies.

It is a well established fact that rabies has appeared among Skunks in various parts of the country, and that men and animals bitten have developed hydrophobia and died. It has been stated that this is a distinct disease among Skunks and is known as mephitic rabies. Others as stoutly maintain that it is not a specific disease of Skunks, but simply canine madness developed in the Skunks by a mad dog or fox. An interesting discussion of the subject may be found in the *American Journal of Science and Art,* May, 1874, and in the *New York Medical Record,* March 13, 1875.

Photograph by S. A. Lottridge

THREE OF A KIND

A happy family of little Skunks, caught napping upon a log

Regarding the economic value of this animal, aside from the value of its fur, Dr. A. K. Fisher says: "The Skunk is a 'chicken thief' which renders important service by destroying immense numbers of mice, white grubs, grasshoppers, crickets, hornets and other noxious forms. Although it prefers this kind of food, like the Opossum, it will eat almost any animal matter and also at times certain wild fruits and berries. It is said to be fond also of eggs and young chickens, but the writer has known a mother Skunk to make her nest and rear her young in the inner walls of a chicken yard, and neither egg nor fowl was molested."

BADGER

Taxidea taxus (*Schreber*)

General Description.— Form thick-set and about size of a spaniel. Body muscular; tail short; legs short; front feet powerful with long claws and adapted for digging; ears short; head broadly triangular; nose sharp; hair long and falling from sides like a mantle; general color silvery gray with white markings on face.

Dental Formula.— Incisors, $\frac{3-3}{3-3}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{3-3}{3-3}$; Molars, $\frac{1-1}{2-2}=34$.

Pelage.— ADULTS: Sexes similar, seasonal variation slight. General color above, silvery gray, the hairs being yellowish white at base, then blackish with white tip; neck, crown and muzzle brown; cheeks, chin and stripe from nose over forehead to shoulders white; underparts yellowish-white; bar on each cheek, back part of ear and feet dull black; tail yellowish-brown. YOUNG: Similar to adults.

Measurements.— Length, 28 inches; tail, 5 inches; hind foot, 4 inches. Weight, 15 pounds. Sexes similar in size.

Range.— Northern Indiana west to Sierra Nevada Mountains, south to Kansas and New Mexico, north to Saskatchewan, latitude 55°.

Food.— Small mammals and occasionally birds, but principally ground squirrels, gophers, prairie dogs and mice.

Remarks.— The Badger may be easily distinguished from all other members of the family *Mustelidae* by its large size, grayish color and peculiar depressed appearance, due partly to structural arrangement, and partly to the long mantle of hair falling from his sides, which gives him a flattened out appearance. It is a very powerfully built adaptation of nature for digging. But one species of Badger is known, although this species has been subdivided again into four subspecies, only three of which are found in the United States.

Related Forms

Common Badger.— *Taxidea taxus taxus.* (Schreber). Typical animal as described above. Central North America from the Great Lakes to the western slopes of the Rockies, from Texas as far north as latitude 55°.

Western Badger.— *Taxidea taxus neglecta* (Mearns). Smaller, tail longer, color deeper and richer. California.

Berlandier's Badger.— *Taxidea taxus berlandieri* (Baird). White line on back extending to tail; general color buffy; other markings heavier. Texas, New Mexico, Arizona.

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BADGER AT BAY

The Badger is inoffensive enough until cornered, when it will fight " like a stack of Wild Cats "

The Badger has been called a timid animal. It is, rather, a prudent one for it avoids rather than confronts danger. It prefers the safety of its underground retreats to the chance of unequal combat. Certainly, no lack of courage and physical endurance is seen when the creature, captured or cut off from its retreat, is brought to bay. Its pluck is then as conspicuous as its really formidable strength. Because of this well-known fact the cruel sport of " Badger-baiting " was formerly indulged in, in the West; and if the animal were given a barrel or similar retreat in which it was secure from attack in the rear, it proved more than a match for any dog. The fighting qualities of the Badger, and the stubborn resistance it offers at whatever odds, have supplied our language with a word of peculiar significance: to " badger " is to harass and worry.

The stout, thick-set, and depressed shape of the animal is greatly in its favor, combining with the long loose hair to prevent a dog from reaching vulnerable parts, and to embarrass it in attempting to take hold; the snap of the jaws inflicts a serious wound; and, finally, it possesses extreme tenacity of life.

Dr. J. S. Newberry gives the following evidence of the Badger's powers of self-defence:

"In traversing the arid surfaces of the sage plains of eastern California, Utah and Oregon, there is, perhaps, no one thing which the traveler may be more sure of seeing every day of his journey than the burrow of a Badger; and, after cursing the country, and the folly which led him to cross these barren, hot and dusty surfaces, there is nothing he will more certainly do, whether on foot or mounted, than tumble into one of these same Badger holes. And yet the chances are more than equal that he never sees a living Badger on which to revenge himself; for the Badger is a shy and timid animal, and the country he inhabits is so open, it rarely happens that he is surprised at a distance from his burrow. During our march of several hundred miles through the country inhabited by the Badger this did occur, however, on one or two occasions, and gave rise to some ludicrous scenes. The Badger, though far from formidable, is too well provided with teeth to be handled without gloves; and knowing that his only safety when attacked is in plunging to the bottom of his burrow, his pig-headed pertinacity in endeavoring to reach it is such, that an unarmed man finds it difficult to stop him.

"Mr. Anderson, who gave me most efficient aid in collecting, came one day suddenly upon a Badger at some distance from his hole; of course, he made for it with all possible speed, which, it should be said, is not so great but that a man could easily overtake one. Mr. Anderson at first endeavored to trample him under his horses's feet, but, though he ran over him several times, the Badger avoided the hoofs and received no injury. As we had not obtained a specimen, he was particularly anxious to secure this one, so he drove his horse before him, and brought him to bay. He then jumped off, hoping by means of kicks and his sheath knife, to dispatch him; but the Badger, instead of retreating, came at him open-mouthed, and with such a show of ferocity that he was fain to let him pass, trusting to find a club to kill him; but in this region clubs do not 'grow on every bush,' for most of the bushes are sage bushes, and before he found any sort of stick the Badger had reached his hole."

Sir John Richardson narrates an incident which further illustrates the prowess of this stubborn, sullen customer. "The strength of its fore-feet and claws is so great," says he, "that one which had insinuated only its head and shoulders into a hole, resisted the utmost endeavors of two stout young men who endeavored to drag it out by the hind legs and tail, until one of them fired the contents of his fowling-piece into its body." This is quite a match for the stories told of the Armadillo itself. "Early in the spring, however," the author continues, "when they first begin to stir abroad, they may easily be caught by pouring water into their holes; for the ground being frozen at that period, the water does not escape through the sand, but soon fills the hole, and its tenant is obliged to come out."

The author of the "Complete American Trapper" also refers to this method of taking Badgers, and adds others: "Although his general appearance will not indicate it, he is a sly and cunning animal and not easily captured in a trap of any kind. He has been known to set at defiance all the traps that were set for him, and to devour the baits without suffering from his audacity. He will sometimes overturn a trap and spring it from the under side before attempting to remove the bait. Although not quite as crafty as the Fox, it is necessary to use much of the same caution in trapping the Badger, as a bare trap seldom wins more than a look of contempt from the wary animal."

"The Badger," adds Coues, "above all other animals is notable for its flatness; even when runnings it looks broad and flat, and the belly seems to sweep the ground during its rather low, heavy, and awkward progress. Seen when crouching in fancied security or hoping to escape observation (and it will sometimes remain long motionless in this posture, permitting near approach), the animal might easily be mistaken for a stone or clod of earth; the very hairs lie flat, as if parted in the middle, and form a fringe along either side, projecting like the shell of a turtle or the eaves of a house."

The ordinary Badger may be found from British North America, from latitude 55°, down through the greater portion of the United States.

In habits it closely resembles the European species, being strictly nocturnal, and living in burrows constructed by itself. In the colder portion of its habitat it hibernates. Although but very seldom seen, these animals live in countless numbers in the region of the Upper Missouri river and its tributaries; tracts of sandy soil being so full of their burrows as to render traveling on horseback dangerous. These Badger holes can be distinguished from those of the Prairie Dog by their larger size and the absence of a circular mound of earth at their entrance; though many such holes are merely burrows of the Prairie Dog, which have been enlarged by the Badger in order to capture the original owner.

Its chief food is rodents and other small animals — even insects and snails — while it is also partial to birds' eggs and to bees nests with their honey and larvae.

Little seems to be known as to the breeding habits of the Badger, but three or four young is the usual number in a litter. In British North America the period of hibernation lasts from October till April, and the animals come forth after their long fast in good condition.

"Badgers are valuable in destroying ground squirrels, gophers and other burrowing animals, as well as various kinds of insects," says Dr. A. K. Fisher. "They are extensive diggers, and seem to have little trouble in securing their victims. For their valuable service, full protection should be given them, especially in irrigation sections where they sometimes dig into dikes in pursuit of rodents which in the role of dike-borers cause so much trouble."

CANADA OTTER

Lutra canadensis (*Schreber*)

General Description.— Very large for one of the *Mustelidae*. Body long; legs short; toes webbed; soles of feet hairy; tail long and rounded, thick at base and tapering; head broad and flattened; nose short; general color brownish; dense underfur. A very strongly muscled, lithe and active animal.

Dental Formula.— Incisors, $\frac{3-3}{3-3}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{4-4}{3-3}$; Molars, $\frac{1-1}{2-2}=36$.

Pelage.— Sexes similar. Young very much like adults. Seasonal variation slight. Color in general, dark rich ochraceous brown becoming somewhat paler and grayer below; lips, cheeks, chin and throat pale brownish gray to grayish-white. The long outer hairs are hard and glossy; the underfur is dense, short and soft.

Measurements.— Sexes nearly equal. Length, 40 inches; tail, 12½ inches; hind foot, 4 inches. Weight, 20 pounds.

Range.— Greater part of the United States and Canada except on extreme southeastern and northwestern coast of the United States.

Food.— Largely fish, with a few small mammals and birds.

Remarks.— The Otter is one of the most aquatic of the group to which he belongs, being exceeded in this respect only by the Sea Otter. The long well-muscled body, the webbed feet and the long tail enable it to pursue fish in their own medium. The Otters have been separated into some seven species and subspecies known north of the Rio Grande. The differences that separate them are mainly in color, size and cranial characters.

RELATED SPECIES

Canada Otter.— *Lutra canadensis canadensis* (Schreber). Typical animal of the above description. North America from Alaska to Hudson Bay and eastern Canada, south to Washington, thence south to Texas, and east to the Atlantic Coast, north of Florida.

Southern Otter— *Lutra canadensis lataxina* (F. Cuvier). Smaller. North Carolina to Louisiana, south to Florida.

Florida Otter.— *Lutra canadensis vaga* (Bangs). Larger and redder. Florida.

Sonoran Otter.— *Lutra canadensis sonora* (Rhoads). Large and yellowish. Arizona, Colorado, Utah and New Mexico.

Pacific Otter.— *Lutra canadensis pacifica* (Rhoads). Color paler. California north to British Columbia.

Newfoundland Otter.— *Lutra degener* Bangs. Size small. Newfoundland.

Queen Charlotte Islands Otter.— *Lutra periclyzomae* Elliot. Size large. Queen Charlotte Islands.

The Otter is an aquatic animal which swims and dives with great readiness, and with peculiar ease and elegance of movements; and although its action on land is far from awkward and difficult, yet it is certainly in the water that the beautiful adaptation of its structure to its habits is most strikingly exhibited. It swims in nearly a horizontal position, and dives instantaneously after the fish that may glide beneath it, or pursues it under water, changing its course as the fish darts in various directions to escape from it, and, when the prey is secured, brings it on shore to its retreat to feed. As the Otter lives exclusively on fish, when it can procure them, it frequents lakes, rivers, smaller streams, ponds, and not unfrequently descends to the sea; and the havoc which it makes among the finny inhabitants is almost incredible. In feeding, it holds the fish between its fore-paws, eating first the head.

Otters are generally found either in pairs or in family parties of five or six. Their homes are made in or near the banks of a river or lake, the hollows beneath the roots of trees growing on the margin being special favorites, while in hilly districts the clefts between rocks are selected, and where the soil is of an alluvial nature deep burrows, with several entrances, one of which usually opens beneath the water, are excavated in the banks.

Otters apparently never hibernate, and in consequence must be hard pressed to supply themselves with food during the winter in the colder portions of their habitat. At such times they may make occasional raids on the farmyards. Water-fowl are probably also attacked at such periods, while eggs are always acceptable. In addition to fish, Otters are fond of frogs and shell-fish.

The number of young in a litter is usually two, although there may be either one or three. They are born about the middle of April, and during the summer and autumn the young stay with their mother.

The fur of the Otter, says Coues, is of great beauty, very thick, close, short and shining. The longer hairs are stout and glistening; the very copious under-fur is lanuginous and lustreless. The sheen is only visible in its perfection when the pelt is viewed with the lay of the hairs; from the other direction the color is plain. The roots of the hairs, even on the darkest part of the pelage, are light brown, or dingy white, but the fur is so close that this does not appreciably affect the rich brown tone of the surface.

According to Richardson, one of the earliest authors giving accounts of the species with precision, "The Canada Otter resembles the European species in its habits and food. In the winter season, it frequents rapids and falls, to have the advantage of open water; and when its usual haunts are frozen over, it will travel to a great distance through the snow, in search of a rapid that has resisted the severity of the weather. If seen, and pursued by hunters on these journeys, it will throw itself forward on its belly, and slide through the snow for several yards, leaving a deep furrow behind it. This movement is repeated with so much rapidity, that even a swift runner on snow-shoes has much trouble in overtaking it. It also doubles on its track with much cunning, and dives under the snow to elude its

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OTTERS

Otters are too short of limb to move easily on land, but are wonderfully agile and graceful in water. They are also fond of sliding down mud banks

pursuers. When closely pressed, it will turn and defend itself with great obstinacy."

The sliding of the Otter seems to be a favorite amusement of this creature. Godman speaks of the diversion in the following terms: "Their favorite sport is sliding, and for this purpose in winter the highest ridge of snow is selected, to the top of which the Otters scramble, where, lying on the belly with the fore-feet bent backwards, they give themselves an impulse with their hind legs and swiftly glide head-foremost down the declivity, sometimes for the distance of twenty yards. This sport they continue apparently with the keenest enjoyment until fatigue or hunger induces them to desist."

Statements of similar import are made by various writers, and accord with Audubon's observations: "The Otters ascend the bank at a place suitable for their diversion, and sometimes where it is very steep, so that they are obliged to make an effort to gain the top; they slide down in rapid succession where there are many at a sliding place. On one occasion we were resting on the bank of Canoe Creek, a small stream near Henderson, which empties into the Ohio, when a pair of Otters made their appearance, and not observing our proximity, began to enjoy their sliding pastime. They glided down the soap-like muddy surface of the slide with the rapidity of an arrow from a bow, and we counted each one making twenty-two slides before we disturbed their sportive occupation."

The general intelligence of the Otter is of a high order, and his docility is such that he may not only be thoroughly tamed, but taught to work for his master. Audubon speaks of four American Otters which were tamed so completely that they would answer a whistle like dogs, and became very agreeable as well as useful pets.

SEA OTTER

Latax lutris (*Linnaeus*)

General Description.— Size very large, general appearance much as Canadian Otter. Body long; fore-feet small; hind feet large, fully webbed, flapper like, haired on both surfaces; tail flattened, smooth, about one quarter length of body; claws of moderate length; ears very small and low on side of head; skin very loose on body; fifth toe longest, others diminishing to the first; molar teeth large and smooth on crown; color dark, frosted with white tipped hairs.

Dental Formula.— Incisors, $\frac{3-3}{2-2}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{3-3}{3-3}$; Molars, $\frac{1-1}{2-2}=32$.

Pelage.— Sexes similar. Seasonal variation slight. Color black, with white tips to the longer hairs, giving frosted appearance; head and neck grayish-white or yellowish-white; an exceedingly dense underfur is present, formed of shorter and softer hairs, and through this coat a much less dense outer coat penetrates, the hairs hard and lustrous. In summer the long, white-tipped hairs are more numerous, producing a grizzled appearance.

Measurements.— Length, 48 inches; tail, 11 inches; hind foot, 6 inches long and 4 inches wide.

Range.— North Pacific south to California in kelp beds among rocky islands and along the coast. Now a very rare animal, and nearly extinct on American shores.

Food.— Fish, mussels, clams and molluscs.

Remarks.— The Sea Otter is the most highly specialized member of the *Mustelidae,* being purely aquatic in its habit and taking all its food in the water. Although so highly developed, it has yet retained many of its more primitive characters, and is readily seen to be related to its kindred ashore. Specimens of the Sea Otter are very rare in collections, and but little is known of its life history. One species divided into two subspecies is known.

RELATED FORMS

Sea Otter.— *Latax lutris lutris* (Linnaeus). Typical animal as described above. North Pacific south to California.

Southern Sea Otter.— *Latax lutris nereis* Merriam. Much like the typical form. Waters off California coast.

The Sea Otter is an inhabitant of both coasts of the North Pacific; its chief haunts on the American side being Alaska, the Aleutian Islands, the neighborhood of Sitka Island on the west coast of Canada, and Vancouver Island; its southern limits being the shores of Oregon. On the Asiatic side it occurs in Kamschatka, but apparently more rarely than on the eastern shores of the Pacific.

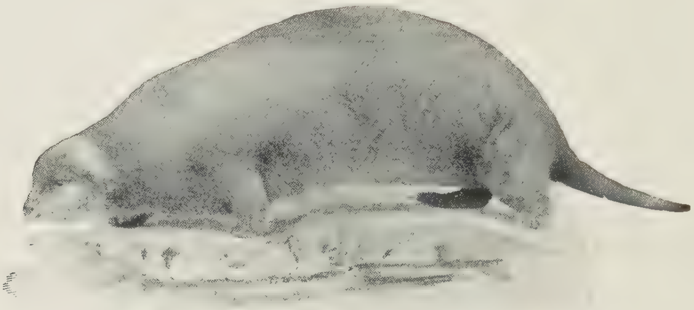
When the Russian traders first opened up the Aleutian Islands, they found the natives commonly wearing cloaks made of the fur of the

Sea Otter, which they were at first willing to sell for a mere trifle, esteeming these skins much less than they did those of the fur-seals. Again, when the Prybiloff Islands, situated in Behring Sea to the eastward of the Aleutians, were first discovered, upwards of five thousand skins of this species were taken in the first season, with the result that in six years these animals had completely disappeared from the islands. Nearly the same story is told in all the haunts of the Sea Otter, which has now become a very rare animal indeed, and stands in sore need of protection if it is to escape total extermination.

Mr. H. W. Elliott, states that "over two-thirds of all the Sea Otters taken in Alaska are secured in two small areas of water, little rocky islets and reefs around the islands of Saanach and Chernobours, which proves that these animals, in spite of the incessant hunting all the year round on this ground, seem to have some particular preference for it, to the practical exclusion of nearly all the rest of the territory. This may be due to its better adaptation as a breeding-ground." A similar preference is also shown for a small area in the neighborhood of Gray's Harbor, over the whole of the remainder of the coast of Washington and Oregon.

The female Sea Otter produces but a single young one at a birth, so that the increase of the species can be, at best, but slow. The young may apparently be born at any season of the year, and do not attain maturity till four or five years old. Writing of the general habits of the species, Mr. Elliot observes that the "mother sleeps in the water on her back, with her young clasped between her fore-paws. The pup cannot live without its mother, though frequent attempts have been made by the natives to raise them, as they often capture them alive, but, like some other species of wild animals, it seems to be so deeply imbued with fear of man that it invariably dies from self-imposed starvation."

The remarkable difference in the structure of the cheek-teeth of the Sea Otter from those of the true Otter clearly indicates that there must be an equally marked difference in the food of the two; and the rounded prominences on the crowns of those of the present species would further suggest that they were adapted for pounding and crushing hard substances. As a matter of fact, Mr. Elliot tells us that the food of the Sea Otters "is almost entirely composed of clams, mussels, and sea-urchins, of which they are very fond, and which they break by striking the shells together, held in each fore-paw, sucking out the contents as they are fractured by these efforts; they also undoubtedly eat crabs, and the juicy tender fronds of kelp or sea-weed and fish."



SEA OTTER

The fur of this animal is so valuable that it is in danger of extinction from over-hunting

The flesh of the Sea Otter is very unpalatable, highly charged with a rank smell and flavor.

Old hunters assert that they have watched the Sea Otter for half an hour at a time as it lay upon its back in the water and tossed a piece of sea-weed up in the air from paw to paw, apparently taking great delight in catching it before it could fall into the water. It will also play with its young for hours.

The quick hearing and acute smell possessed by the Sea Otter are not equaled by any other creatures in the territory. They will take alarm and leave from the effects of a small fire four or five miles to the windward of them; and the footstep of man must be washed by many tides before its trace ceases to alarm the animal, and drive it from landing.

Sea Otters are not polygamous. A pair will usually mate for life. Neither are they social animals. Only one at a time is usually met with at sea, unless it is a mother with her young one.

The pelage is extremely valuable. In the days when the animal was plentiful, skins brought from $100 to $500 apiece. Now that it is fast disappearing, skins are sold for as high as $1500 and even more. For this reason, the Sea Otter is relentlessly hunted, although usually a hazardous business, on account of the wild country it inhabits. One of the first official steps to protect the Sea Otter was the setting aside of a preserve on Afognak Island, on the southern coast of Alaska, in 1892. This was placed under the jurisdiction of the Federal Bureau of Fisheries. Without such protection, it would be doomed to extermination, and this despite the fact that it is one of the shyest and keenest of animals.

From a drawing by Henry Thurston

SEA OTTER

The Sea Otter is an inhabitant of both coasts of the North Pacific: its southern limit on the American side being the coast of Oregon. But it is now extremely rare

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COUGAR

Known also as the Puma, Panther, Mountain Lion and Catamount, this beast was formerly numerous and widely scattered throughout temperate North America

THE CAT FAMILY

(*Felidæ*)

THE family of Cats is one of the most sharply defined of all the Carnivores or flesh-eating animals. Whether seen in its most familiar form, the House Cat, or in the larger members from the jungle, such as the Lion or Tiger, the strong family traits can instantly be noted. These are not only found in the peculiar shape of the skull and the facial traits, but also in certain, characteristic habits, such as washing the face, "sharpening" the claws, and contracting the pupils of the eyes.

The Cats have long, sharp retractile claws. The feet are digitigrade, with five toes on each fore foot, and four on each hind foot. The soles are hairy, and pads naked. The tongue is covered with sharp, horny, backwardly directed papillæ. The powerful jaw is armed with a large shearing tooth, or carnassial. The skull is short and broad, with a very short face. The clavicles do not articulate, or hinge, with the scapulæ or sternum.

In America there are four or five typical large members of this family living in a wild state.

COUGAR

Felis couguar *Kerr*

Other Names.— Panther, Puma, Mountain Lion, Catamount.

General Description.— A very large, cat-like animal with a long tail. Body long and lithe; legs moderately long; tail long and round, more than half the length of head and body; claws long, sharp, curved; soles haired, pads naked; general color pale tawny brown above, dirty white below; tail tipped with black; ears prominent, without tufts of long hair. Young spotted.

Dental Formula.— Incisors, $\frac{3-3}{3-3}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{3-3}{2-2}$; Molars, $\frac{1-1}{1-1} = 30$.

Pelage.— Adults: No difference between the sexes and color in winter much the same as in summer. Color variable; upper parts from yellowish to reddish brown, darkest along the middle of back; beneath dirty white; black patch at base of whiskers; lips and chin white; back of ear black; tip of tail dusky; hair everywhere rather close, thick and soft to the touch; whiskers prominent. Young: Spotted in the first coat, the ground color being tan, the spots dark brown.

Measurements.— Length, 7 feet; tail, 30 inches; hind foot, 10 inches. Sexes about equal, the male about a foot longer than female. Weight of male, 200 pounds.

Range.— Formerly throughout eastern North America from about the Canadian line south to the Gulf, but now extinct in the easternmost part of this region.

Food.— Mammals and birds; especially destructive to deer, elk and domestic stock, colts in particular.

Remarks.— This beautiful animal while formerly known all over eastern North America has been driven out by civilization and the disappearance of its prey until now it is nowhere found in anything like its original numbers until the western part of its range is reached. Cougars are found throughout western North America and on the Pacific Coast as well, but this animal differs enough from the eastern form to be given another name. The Cougar, like the Grizzly Bear, has received various treatments at the hands of the classifiers, but for the purpose of this book, it is best to consider the group north of the Rio Grande as being composed of 5 species and subspecies.

Related Species

Eastern Cougar.— *Felis couguar* Kerr. Typical animal as described above. Eastern North America from Canada south to the Gulf.

Southern Cougar.— *Felis coryi* Bangs. Legs long; feet small; color ferruginous brown. Florida.

Oregon Cougar.— *Felis oregonensis oregonensis* Rafinesque. Size large. Northwest coast east to Rocky Mountains.

Rocky Mountain Cougar.— *Felis oregonensis hippolestes* (Merriam). Above, pale fulvous brown, darkest on the back; tip of tail black; face to eyes grayish-brown; under side soiled white; under side of tail grayish-white. Rocky Mountains.

Brown Cougar.— *Felis azteca browni* Merriam. Paler and grayer than eastern Cougar. Size probably smaller. Southern California and Arizona.

Next to the Jaguar, the Cougar is the largest of the American Cats. In color it is a tawny brown, becoming lighter on the lower surface, and without any spots at all. But the odd thing is that its young are marked all over with large blotches of blackish brown, while their tails are ringed with black like that of the Tiger. And these markings do not disappear until the animal is more than six months old.

The Cougar is found in western parts of the American continent, from British Columbia in the north to Patagonia in the south, and it is even said to have been seen in Tierra del Fuego. Being so widely distributed it rejoices in several names. In the Northwest they call it the "Mountain Lion," in the Southwest the "Cougar;" the Mexicans and South Americans know it by the sobriquet "Puma;" to the naturalist it is *Felis* several things; J. Fenimore Cooper names it the "Varmint," and in the Gulf States it answers to the chill-producing name of "Panther," while the early settlers in the East called it the "Catamount," and the "Painter;" but whatever the name, and whatever the locality, it is one and the same Cat.

Mr. Edward Ferguson thus describes him: "A massive broad flat head, malignant yellow eyes, muscles and sinews like coiled springs of steel wire, the hate of a demon, a cunning that surpasseth understanding, viciousness personified, all wrapped up in a tawny reddish coat ending in a long, cylindrical, nervous tail; this is the American Mountain Lion. This big Cat, one of the largest of the American varieties, averages forty inches from nose to root of tail, and the latter is more than half the length of the body. He is sleek and thin of flank, graceful and willowy of movement, and anything but pretty to the eye. No mane adorns his shoulders, no stripes relieve his coat, his belly fur is usually a dirty white, his ears are large and round, and his only ornament is a little tuft of hair at the end of his tail.

Photograph by Daniel J. Singer

COUGAR

Quick, alert, and agile in its actions, this big Cat is powerful enough to be dangerous to man — but as a matter of fact, it is slinking and cowardly

"His range is greater than that of any other member of the Cat family and extends for over a hundred degrees of latitude, from Northern Canada to the Argentine, and before civilization drove them back they were found from the Atlantic to the Pacific in considerable numbers. Hardy and tenacious, capable of adapting themselves to all conditions of climate, good foragers and clever thieves, they have not entirely given way in the West Virginia and Kentucky mountains and in the woods of Maine. In the Rockies, they are entirely at home, their haunts are always inaccessible, and it is doubtful if they will ever be exterminated."

Calves, colts, sheep, dogs, chickens, in fact any kind of flesh is the Cougar's diet; it shows a pronounced preference for lamb but when famished will not hesitate to attack a steer. Its midnight raids are carefully planned, its descent on the prey is quick, sure and deadly, it takes no chances and when opportunity offers will kill more than it can possibly consume, wantonly satisfying its lust for blood. These great Cats live in communities, each group ranging over a certain zone, usually along both sides of a valley for many miles of its length. The group consists of one male and from five to ten females, each with her own lair.

The female is nearly as large as the male and is his counterpart in appearance. She picks a permanent abode, a pile of loose rock, under and through which she can crawl. Here with but one possible entrance to guard, she rears her young, and this guardianship is her most serious business in life, for when the litter has been born the male will haunt the neighborhood watching for a chance to kill them.

The extent to which a female Cougar will go in defence of her young is illustrated by a story that Mr. Ferguson tells of a fight between this animal and a Bear which stumbled upon her den. "The Bear peacefully ambled along evidently unconscious of the Lion's presence when, as he approached the pile of rock where her kittens were hidden, the Lion suddenly appeared. She might just as well have remained hidden, and if she had the Bear would, without doubt, have gone on his way in peace. But she didn't — the watchers saw a dark body shoot out and with one long leap land squarely on the Bear's back.

"The surprised brute reared and tried to throw her off, he frantically clawed the air and tried to reach her, then he rolled on the ground; the Lion let go and with another spring was at his throat. The animals were too far away for the watchers to observe closely the details of the fight, but it must have been interesting while it lasted. As it was, they thrashed about and finally, locked in each other's embrace, rolled over the edge and tumbled down the hillside, over and over into the gulch below. The miners found them in the creek bed, both dead, with almost every bone broken."

The Cougar takes readily to the trees, being a much better climber than the Jaguar. But it almost always hunts upon the ground, trying to creep stealthily up to its victim, and to spring upon it before its presence is even suspected. It scarcely ever ventures to attack a man, but will follow him for a long distance as though waiting an opportunity to pounce upon him unawares. But if he suddenly turns and faces the animal, it will always slink away, even if he is quite unarmed. Sometimes too, it will allow itself to be killed without attempting to defend itself at all; so farmers have a rather poor opinion of its courage. The farmers, however, have very good reason for dreading the animal, for it is a terrible enemy to sheep, and has been known to kill as many as fifty in a single night. And it will also leap suddenly upon a horse or cow and break their necks, just as the Jaguar does.

Although, in some ways cowardly, the Cougar will often fight the Jaguar itself. It is the weaker animal of the two, but is so exceedingly quick in its movements, and makes such excellent use of its teeth and claws, that in many cases it gets the better of the battle.

Hunting a Cougar is a highly exciting sport, because of the element of the unexpected. Mr. Charles J. Lisle thus describes such a hunt in Idaho: "Bursting over the little knoll directly ahead of us they came. A long, lithe beast, like a silvery brown shadow, that traveled in unbelievably long leaps, was the first to come in view. I do not think it saw us; but it had run a long way — far longer than a Cougar will usually travel ahead of a pack of hounds — and it was due to take a tree. There was a big-limbed red fir straight ahead of it, standing out apart from all the others. The limbs grew down close to the ground, making it easy to climb. Up the tree sprang the great Cat, not farther than the width of a street from where we stood.

"Hardly had the Cougar reached the middle of the tree and settled down on a comfortable limb when the dogs burst over the crest of the knoll. They were so close that they must have been hunting partly by sight the last few minutes and they were crazed with excitement. As the hunters started in to surround the foot of the tree where the Cougar was, the dogs came at us with the ferocity of a pack of wolves. Williams called sharply to the pack, and none of them bit him; but two of our party were bitten before the dogs realized that we were not the Cougar!

"Meanwhile, the great Cat lay flattened out on the limb of the tree, fifty feet above the ground. It was a pretty shot, one that no one could miss. One of the hunters drew up his rifle, took a quick but careful aim, and put a 30.30 bullet through the eye of the big beast. There was a crash as the nearly 200 pounds of Cougar fell down through the small limbs to the earth. Then the dogs leaped upon the prostrate foe — a foe that would have attacked as willingly if it had been uninjured and alive, but that alive would have killed in detail ten times as many dogs as there were in the pack — and it was only by the most violent exertions that Williams could draw them off. Fortunately, the Cougar was dead and had not the power to fight back, otherwise the pack would have been badly cut up."

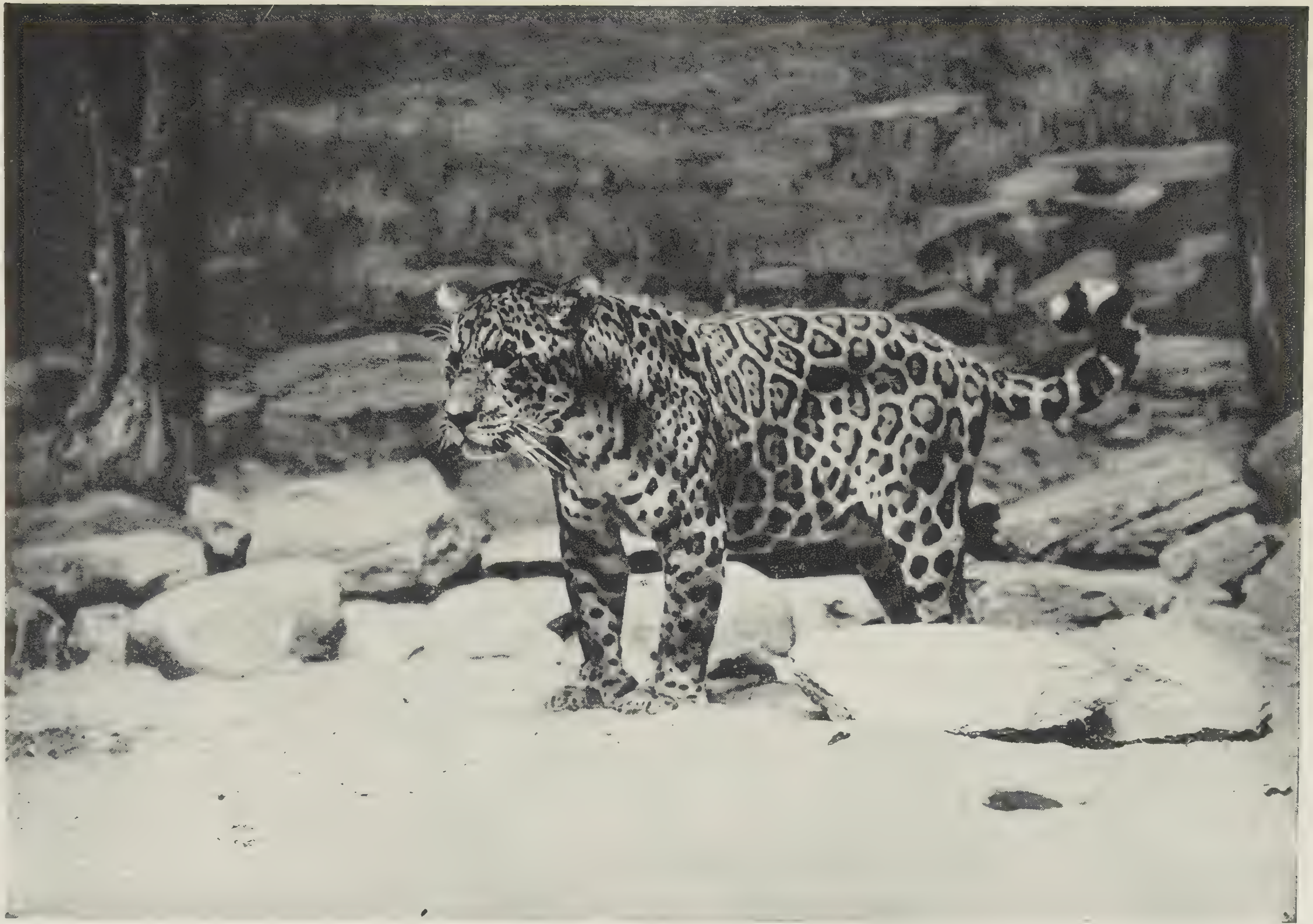
Colonel Roosevelt says of the Cougar's peculiar traits: " It is the special enemy of the Mountain Sheep. In 1886, while hunting White Goats north of Clarke's Fork of the Columbia, in a region where Cougars were common, I found them preying as freely on the Goats as on the Deer. It rarely catches Antelope, but is quick to seize Rabbits, other small beasts and even Porcupines.

" No animal, not even the Wolf, is so rarely seen or so difficult to get without dogs. On the other hand, no other wild beast of its size and power is so easy to kill by the aid of dogs. There are many contradictions in its character. Like the American Wolf, it is certainly very much afraid of man; yet it habitually follows the trail of the hunter or solitary traveler, dogging his footsteps, itself always unseen. When hungry it will seize and carry off any dog, yet it will sometimes go up a tree when pursued even by a single small dog, wholly unable to do it the least harm. It is small wonder that the average frontier settler should grow to regard almost with superstition the great furtive Cat which he never sees but of whose presence he is ever aware. The Cougar is as large, as powerful and as formidably armed as the Indian Panther, and quite as well able to attack man; yet the instances of its having done so are exceedingly rare. But it is foolish to deny that such attacks on human beings ever occur. It cannot be too often repeated that we must never lose sight of the individual variation in character and conduct among wild beasts."

Photograph by W. L. Finley

COUGAR KITTEN

This pretty little Cougar kitten is evidently meditating upon something interesting. Note the crafty expression even in the very young animal



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"SENOR LOPEZ"

The famous Jaguar that has thrived for many years in captivity, in the New York Zoological Park

JAGUAR

Felis hernandezii (*Gray*) = Felis onca *Linnaeus*

General Description.— Largest of the North American Cats. Body larger and heavier than that of Cougar; tail less than half the length of head and body; body spotted; head very large proportionally; jaws powerful; dentition heavy; neck short and thick; color in general golden yellow dotted with hollow spots or rosettes of black.

Dental Formula.— Incisors, $\frac{3-3}{3-3}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{3-3}{2-2}$; Molars, $\frac{1-1}{1-1} = 30$.

Pelage.— ADULTS: Sexes similar. No seasonal variation. Color variable; usual pattern, above brownish or golden-yellow; beneath, white spotted with black; shoulders, neck and head covered with small black spots; body covered with large rosettes or hollow areas of black with one or more black spots in the center and arranged in from five to seven rows; black spot at opening of mouth; tail ringed with black; lips, throat, underparts and under side of tail white; ear behind black, buffy spot near tip; hair close and soft. YOUNG: Tawny gray spotted with black.

Measurements.— Males average larger than females, probably one-fourth. Length, 6 to 8 feet; tail, 20 to 24 inches. Weight of male, 150 to 250 pounds. Weight of female, 120 pounds.

Range.— Red River of Louisiana, and Texas southward into Mexico.

Food.— Deer and other wild animals, pigs, cattle, horses.

Remarks.— This powerful, handsome Cat reaches the United States only as a wanderer from Mexico, as the country north of the Rio Grande is only the extreme edge of its range. There is but the one species known to cross over, and of recent years this has been rarely encountered.

The Jaguar is the largest of all the spotted Cats, being next in size to the Tiger, but second to none in fierceness. South of the Rio Grande it is usually called "El Tigre" (pronounced "Teagre"). Though more essentially intertropical than most of the large felines, its range at one time extended as far north and east as Arkansas. James Capen Adams, better known perhaps as "Grizzly Adams," stated that in the year 1854, in the mountains of Southern Colorado, he met a pair of Jaguars, followed by two cubs. There is no doubt, however, that the Jaguar ranged as far north as latitude 37°, but like many others of our large-game animals, has gradually receded before the trend of civilization. Of late years a few have been taken in Arizona, and in 1910 one was shot in Central Western Texas. At the present writing there are still a few Jaguars within the borders of the United States, but to meet with one is becoming a rare occurrence. From the Rio Grande south they become plentiful, ranging through Mexico, Central America, and as far south as Patagonia in South America.

Unlike the Cougar, Jaguars seem to require a constant supply of water. In contradiction of this, and showing a well-known fact that animals will frequently alter their generally conceded habits, according to their changed surroundings, the Jaguar is found on the great pampas to the north of Patagonia, a place totally unfitted to its usual habits, where it has been attracted by the abundance of mammalian prey.

Few animals surpass the Jaguar in point of beauty, and none in agility or stealth. His every motion is easy and flexible in the highest degree, he bounds among the rocks and trees with an agility truly surprising; now stealing along the ground with the silence of a snake, now crouching with fore-paws extended and his head laid between them, while his checkered tail twitches impatiently and his eyes glare upon his expected victim.

At first glance one might mistake the Jaguar for a heavily built Leopard. In form the Jaguar is thick-set. It does not stand as high at the shoulders as the Cougar, but is a far more powerful animal. Its skull resembles that of a Lion or Tiger, but it is much broader in proportion to its length.

The ground color of the Jaguar varies greatly, ranging from grayish-white to black, while the rosette markings in the two extremes are but faintly visible. The typical color, however, is golden yellow, or a rich tan upon the head, neck, body, outside of legs and tail near the root. The ears are black, with a buff spot at the tip. The nose is usually a pinkish brown. The fleshy part of the lips is black, which, when parted, make the cruel, white fangs stand out in contrast.

The average length of a fine specimen is from six and one-half to seven and one-half feet, the males averaging a foot longer than the females. The tail is much shorter, compared with that of the Leopard, and in a large male seldom exceeds two feet.

Frequently the Jaguar is forced to take to arboreal life during the rainy season, or floods, and, as may be expected, climbs well among the trees and branches. Here, instead of his retreat being a rocky cavern which he uses as a lair, in one place, he "lays up" upon a huge branch where the thick, gnarled foliage shuts out the sizzling sun, and where he can doze quietly through the long, sweltering hours of the day. The pupil of the Jaguar is circular and is not adapted to excess light. Like all the *Felidae,* the animal is nocturnal and prowls stealthily about at sunset and throughout the night in search of prey. While occasionally abroad by day, this is not its custom.

The Jaguar leaving his lair shortly after sunset for the night-long prowl, frequently begins to roar like a lion, until he actually begins to hunt. Jaguars are usually noisy animals, especially during the pairing season and upon stormy nights, when their harsh, rasping roar vibrates through the forest, in tones conveying the impression of great power. There is a widespread difference of opinion, however, as to the tone of his voice, and to the extent he employs it, some insisting that the great Cat is decidedly silent. He may be quiet or noisy, depending on locality, or weather. The English naturalist, Charles Waterton, who spent ten years in the wilds of Guiana, wrote: "During the night the Jaguars roared and grumbled in the forests as though the world was going wrong with them."

Jaguars are indiscriminate feeders and their appetite is a ravenous one; so long as an animal has blood in its body, whether it be red or white, it does not come amiss to their taste. From bugs and lizards to all quadrupeds that inhabit their range, they prey upon them promiscuously, including domestic animals, such as horses, cattle and especially calves and dogs.

In the tropics they also capture for food, the tapir, peccary, agouti, marsh deer, wild fowl, and consume large numbers of fresh water turtles and their eggs. The Jaguar swims well and does not hesitate to follow turtles into the water. Often the great Cat, by a dexterous stroke of his paw, will flip a fish up onto the bank, and this practice seems to be engaged in both for sport and for gain; for all animals, no matter how serious a life they lead, must play a little sometimes, and the Cat family particularly are so inclined.

JAGUAR

"El Tigre" of Central and South America occasionally wanders as far north as Texas, New Mexico, and Arizona. He is a powerful and beautifully marked animal

There are innumerable accounts by reliable men of instances where Jaguars have attacked and killed human beings of their own accord. There are, too, many records showing that they have turned and charged when come upon, or when being pursued by hunters. It is the present observer's opinion, however, that, in the majority of cases, if they are given an option on the safe side of retreat they are more inclined to make off. If the Jaguar does intend to attack, he usually does so at once, and without the usual warning of the Lion and Tiger, which is indicated by throwing the tail up, baring the teeth and uttering violent growls. The great spotted Cat runs with belly almost to the ground with incredible rapidity until it is within a few feet of its adversary, then springs to the shoulders, while it sinks its fangs in the neck and lacerates the body with its great claws.

Conditions being favorable, the female, after attaining the age of three years, brings forth from two to four cubs yearly (two being the usual number), which are about 100 days in gestation, and which when about two or three weeks old are able to follow the mother. Jaguars are monogamous, both the male and female assisting in bringing up the young. At the end of a year they usually shift for themselves, but it is about five years before they attain their full growth. The splendid male Jaguar, "Senor Lopez," was presented to the New York Zoological Park in 1901; he was full grown when he arrived, so that at the present writing he must be at least twenty-one.

The Jaguar and Puma frequently occupy the same range, and there seems to be a decided enmity between them; though the Puma is considered less formidable and less daring, it is, nevertheless, the occasional persecutor of its neighbor.

Like all animals with retractile claws, the Jaguar delights in sharpening them, as it is called; but it is not for this purpose that it scratches the bark on either side of a tree trunk. The object of this practice is to tear off the ragged ends and to cleanse them, and not for the purpose of sharpening them, as is generally supposed. Some assert that each animal has an especial tree to which he repairs for the purpose, and a common method of ascertaining if a Jaguar is in the neighborhood is to examine the trunks of the trees.

Next to hunting the Lion or the Tiger there is no more thrilling sport than the pursuit of the American Tiger. Sportsmen and lovers of animal life are giving more attention to this superb animal, finding that transportation of the present day makes it possible to explore his haunts within the space of a few days. There is still much to learn about this splendid beast, and those who will go and live with him in his native haunts, as the writer has done, may bring back something that the others have failed to note.

Daniel J. Singer.

OCELOT

Felis pardalis *Linnæus*

Other Names.— Tiger Cat, Leopard Cat, Spotted Cat.

General Description.—A medium-sized Cat smaller than the Lynx, with a long slender body, and tail less than half the length of head and body. Form typically cat-like; color pattern striking, made up of irregular stripes and bands of black running lengthwise on a tan or rufus ground color; ears without tufts.

Dental Formula.— Incisors, $\frac{3-3}{3-3}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{3-3}{2-2}$; Molars, $\frac{1-1}{1-1} = 30$.

Pelage.— Sexes similar. No noticeable seasonal variation. Young spotted. Color variable, typical style with upper parts rufous, marked with black lines and spots, some of the latter with rufous centers; flanks and loins yellowish white, striped with rufous, margined with black; legs spotted with black on light buffy ground color; feet buffy-white; cheeks covered by two black lines; chin, throat, breast and belly white, the last two spotted with black; tail dark buff banded and spotted with black, tip blackish. Hair close, glossy and soft.

Measurements.— Length, 38 inches; tail, 15 inches. Weight, 36 pounds.

Range.— Texas from Red River southward in forested regions.

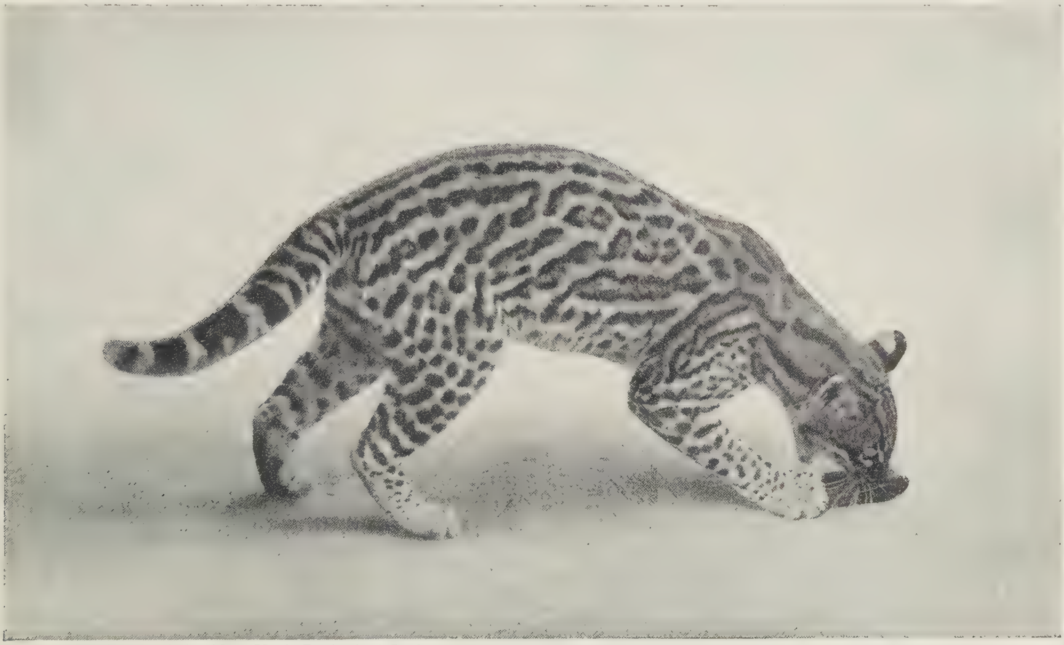
Food.— Small mammals and birds.

Remarks.— Like the Jaguar, the Ocelot is a southern visitor, Texas being its northern limit. No two skins of this animal are ever just alike, so variable are the pattern and the coloration, but so characteristic are its markings that it need be confused with no other American Cat. Only one species crosses over into Texas.

If one talks with hunters or ranchmen about Ocelots, the probability is that they will refer to them as Leopard Cats or Spotted Cats, either of which is by no means a bad designation for them. Ocelots are about the size of the Wild Cat, or Lynx, though of somewhat different build, and with a long tail. They get their name of Leopard Cats, from their beautifully marked fur, resembling in color that of the Leopard; but, instead of being spotted, it is covered with horizontal stripes and bands of black. There is great variety in the marking and coloration of this beautiful animal, so much indeed that Dr. Elliot says: "To vary from each other in the hue and arrangement of the spots and stripes of their coats seems to be one of the chief efforts of the existence of these Cats, and, as if not content with differing from his fellows, an Ocelot usually succeeds in exhibiting a distinct pattern on each of his sides, so that he may be said to differ from himself."

Formerly the Ocelot was seen in Louisiana and Arkansas, but it is doubtful whether it is now to be found in the United States beyond the boundaries of the State of Texas. It prefers brushy and timbered country, is an excellent climber, and in its native haunts will spend hours on the lower limbs of trees waiting patiently and watching intently for its prey. Being especially fond of lambs, young pigs, and kids, Ocelots thus cause much damage to the ranchmen. They are believed to kill turkeys and fawns also, and what they can not eat at the time they will hide under a heap of leaves.

Occasionally, while hunting for other game, the dogs will tree an Ocelot. Mr. Howard Lacey, a Texas naturalist, narrates an experience of this kind: "At the head of the Frio river, the hounds struck a hot trail and were just beginning to get off well together when a splendid male Ocelot sprang into a large cedar close to us. Thinking the hounds might be on a bear trail, I shot the Cat at once, put him behind me on the saddle, and made after the hounds, that were getting off at a good pace. They ran about two miles and then treed a female Ocelot in the bottom of a steep canyon. I think the two were together when we started them, and that they often go in pairs. They are not common here, but I fancy that they often rest in trees and so escape the dogs. They are heavier and more muscular than the Bobcat, and our hounds, that always make short work of a Bobcat, find the Leopard Cat a tough proposition. Unlike the Bobcat, they have the strong odor peculiar to the larger felines, and I never killed one without being reminded of the Lion house at the London Zoo."



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OCELOT

Like most of the Cat tribe, the Ocelot prefers the night to the day, and may seldom be seen abroad until after sundown

Little is known of the breeding habits of the Ocelot. The young are born in late October or early November, and there are usually two kittens at a birth. In this connection Mr. Lacey supplies the following useful information: "I have never had the luck to find any kittens, but a friend of mine ran a female into a cave with his hounds and killed her; then the dogs went into the cave and brought out two kittens a few weeks old. This was in November. Another of my neighbors killed a female and two kittens in a cave near here. This was also in November, and when captured the kittens had not yet got their eyes open."

JAGUARONDI

Felis jaguarondi *Fischer*

Other Name.— Yagourondi.

General Description.— A little smaller in size than the Ocelot, with even more slender body. Body elongate; legs short; tail as long as body with head; general color grizzled brownish-gray; a sinuous cat with somewhat the appearance of a large member of the Weasel tribe.

Dental Formula.— Incisors, $\frac{3-3}{3-3}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{3-3}{2-2}$; Molars, $\frac{1-1}{1-1} = 30$.

Pelage.— Sexes similar and no seasonal variation. General color brownish-gray with hairs annulated and black-tipped, the whole giving a somewhat grizzled appearance, with brown body color; tail like body or sometimes black with rufous tinge, and extreme tips of hair white.

Measurements.— Length, 30 inches; tail, 14 inches.

Range.— South of the United States, but occasionally crossing the Rio Grande into Texas.

Food.— Small mammals and birds.

Remarks.— Like the Ocelot and the Jaguar, the Jaguarondi is not a typical North American mammal if we consider the Rio Grande as a southern limit. There is but the one form of this animal known to reach Texas, although in its southern distribution it is subdivided into several varieties. Some authorities hold that the Eyra, the *Felis eyra* of other authors, is a color phase of the Jaguarondi. Certain it is that the Eyra is very similar to the Jaguarondi, and differs from it only in being a rich brownish red instead of a grizzled brownish-gray, the proportion of the two animals being the same. There are no related species in this country.

This little-known American Cat is an inhabitant of southern Texas, ranging thence southward to Paraguay, east of the Andes Mountains. In appearance it is not unlike an Otter; and some individuals of the species are of a grizzled brownish-gray, the hairs being black-tipped. A closely allied species, the Eyra, a rich brownish-red animal, with long and slender body and a very long tail, is found around the Mexican border. These species are without streaks or spots, and are commonly spoken of as the Gray and Red Cats. Of these differences in color Mr. Vernon Bailey says (in "A Biological Survey of Texas"): "A study of five skins and skulls of the Red Cats and six of the Gray from southern Texas and eastern Mexico, reveals no constant difference other than color. The striking coincidence of range and similarity of habits, as well as of structure, of the Red and Gray Cats strengthens the evidence tending to show that these supposedly distinct species present only another case of dichromatism, comparable to the Black and Cinnamon Bear and the red and gray phases of the screech owl."

Concerning the habits of these animals Mr. B. F. Armstrong says: "These Cats inhabit the densest thickets where the timber (mesquite) is not very high, but the underbrush — catsclaw and granjeno — is very thick and impenetrable for any large-sized animal. Their food is mice, rats, birds and rabbits. Their slender bodies and agile movements enable them to capture their prey in the thickest of places. They climb trees, as I have shot them out of trees at night by 'shining their eyes' while Deer hunting. I capture them by burying traps at intervals along the trails that run through these thick places. I don't think they have any regular time for breeding, as I have seen young in both summer and winter, born probably in August and March. They move around a good deal in daytime, as I have often seen them come down to a pond to drink at midday, and seen them dart through the brush in daytime. They are exceedingly hard to tame."

In the New York Zoological Park there is a fine specimen of the Jaguarondi, which often passes unrecognized; for, as Dr. Hornaday says, "it is so seldom seen in captivity that comparatively few persons north of the Rio Grande are aware of its existence."

CANADA LYNX

Lynx canadensis *Kerr*

General Description.— A stout-bodied, long-legged cat about the size of a good-sized cocker spaniel. Ears prominent, tufted; fur dense and long; feet very large; claws sharp and strong; tail very short and blunt; legs very long giving animal a grotesque appearance; a ruff of long hairs on sides of head.

Dental Formula.— Incisors, $\frac{3-3}{3-3}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{2-2}{2-2}$; Molars, $\frac{1-1}{1-1} = 28$.

Pelage.— Adults: Sexes similar. Seasonal variation not conspicuous, color in winter paler and grayer than in summer. General color light gray more or less grizzled with brown, darker on the head and back where the long hairs are black with occasional white tips; belly and throat grayish white; ears behind, black with central spot of whitish; ear tufts brownish black usually more than an inch and a half long; black spots at corners of mouth; black bars on ruff at sides of head, and black tip on tail; a few dusky spots on inside.

Measurements.— Length, 36 inches; tail, 4 inches; hind foot, 9½ inches. Male rather larger than female. Weight of male, 25 to 40 pounds.

Range.— Boreal America from the latitude of Maine to 60° N., and from Atlantic to Pacific Oceans.

Food.— Any mammal that it can kill, and birds.

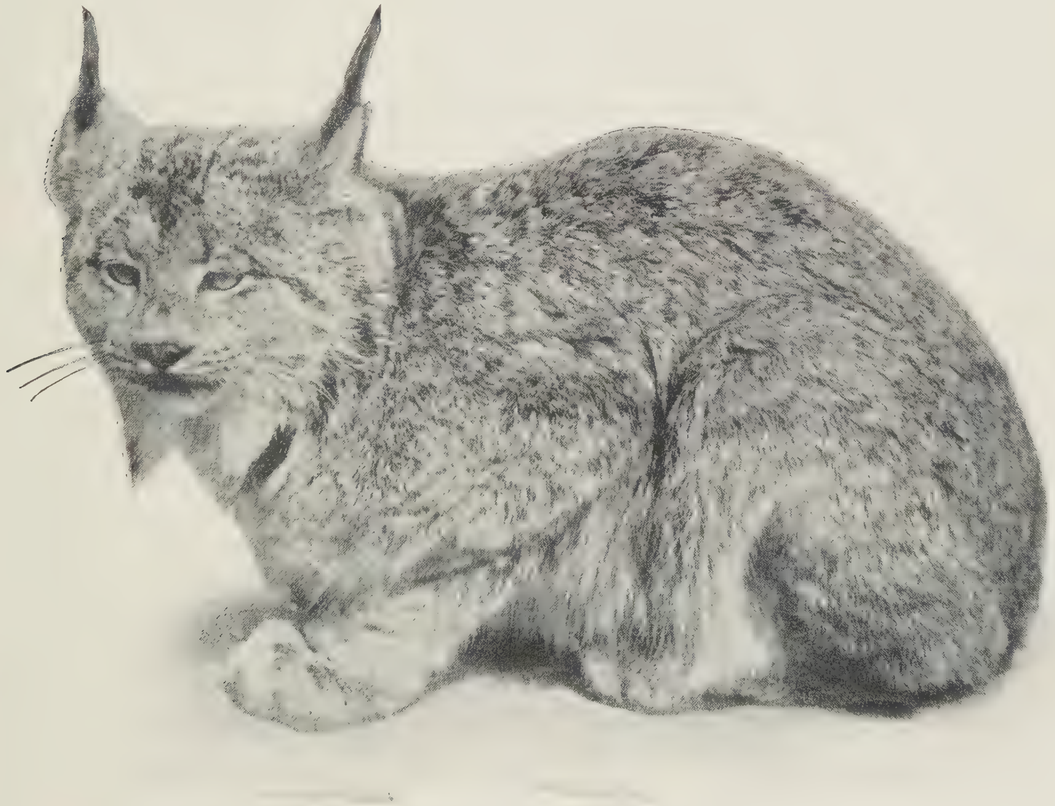
Remarks.— The Canada Lynx need be confused with no other of the North American Cats, with the possible exception of its very near relative, the Bay Lynx or Wild Cat, because of its long legs, large paws, bobbed tail and tufted ears. From the Bay Lynx it may be distinguished by its unringed tail, tufted ears and larger size as well as less prominent color differences. This group has been separated into three varieties.

Related Species

Canada Lynx.— *Lynx canadensis canadensis* Kerr. Typical animal as described above. Boreal North America from latitude of Maine to 60° N., and from Atlantic to Pacific Oceans, possibly only south of Alaska.

Alaska Lynx.— *Lynx canadensis mollipilosus* Stone. Browner in color, otherwise like Canada Lynx. Alaska.

Newfoundland Lynx.— *Lynx subsolanus* Bangs. Size of Canada Lynx, but darker. Newfoundland.



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CANADA LYNX

One of the handsomest of the Cats, and also exceedingly active and muscular. Note the enormous fore paw

The Canada Lynx is one of the most widely known of northern animals. It is the "Lucivee" (*Loup cervier*) of Canadians. It has a somewhat clumsy appearance, its legs being very muscular and its paws enormously disproportionate to its lean body. The color of its coat is usually a dark gray with chestnut tinge, and the shading renders it indistinct against any background. It is described by Mr. J. C. Nattrass as "an extremely wary and timid animal, and possessing the faculty of concealment to a wonderful degree. He will, like the Cougar, hide himself on a small limb, flattening himself out thereon so that he is almost concealed; and only the most vigilant and well-trained eye can discover him." Its main food consists of cotton-tail rabbits, mice and small birds; it is partial also to the heads of grouse, and it delights in a small deer. It is very clever in unearthing deer, sheep, and young pigs which the Cougar has hidden away for future consumption.

Strangely enough, although such a powerful animal, the Lynx is not by any means tenacious of life, a slight blow on the back sufficing to kill it. It is a very good swimmer. Mr. Edward A. Preble, when in the upper Mackenzie region, saw one cross the Nahanni river. "It swam readily in the swift current, and on reaching the shore bounded away into the forest, apparently little fatigued by its violent exertions." In the same region "the Indians capture the Lynx by snaring, the noose being made of heavy twine or babiche. In setting the snare, a circular inclosure about five feet in diameter is made by sticking pieces of brush into the crusted snow. One or more openings are left, in which the noose is placed at the proper height, so that the animal attempting to enter the pen will put its head into the loop. In the center of the inclosure is placed a split stick smeared with the contents of the musk glands of the Beaver, sometimes mixed with perfumery of some sort, which serves to attract the animal. The snare is attached to the middle of a stout stick three or four feet long, which acts as a drag when the animal is caught. It thus generally becomes entangled in the brush and after a few struggles remains passive, and, if the weather is cold, quickly freezes to death. The flesh of the Lynx is said to be very palatable, and is eaten by the natives and to some extent by the white residents."

Unlike the Bobcat, the Canada Lynx seldom invades the farmyard; it dwells in the deep forests far from the haunts of man. Stone and Cram think that the Lynx "must necessarily go without food often for days together in the winter, glad enough perhaps to pull some frozen scrap of flesh or skin out of the snow, dropped there by some more fortunate hunters weeks before. The lack of insect scavengers is not felt in the woods in winter; every scrap of flesh that is scattered is wanted by one warm-blooded creature or another before warm weather comes again. The Lynx appears to have its summer home in tangled thickets of young growth, where the interlocking branches of fallen trees afford protection. Here the ill-natured kittens [usually two at a birth] are raised and taught to hunt."

A female Lynx, owned by Mr. J. C. Nattrass, had been trained as a kitten and brought up in his family as a domestic cat. It lost many of the traits of its wild kin, and acquired others of the house cat. Says Mr. Nattrass: "She is a beautifully marked animal. She shows all the markings of her grandfather except the tufted and pencilled ears and the heavy limbs. She is a gentle, affectionate, and intelligent animal. The children can tease her with impunity; but game must never be allowed near her, for when her teeth close on a game bird, her wild instincts are aroused. She is then a fury, and will fight to the death. While cleaning some grouse one day, several of them being laid out on the table, she came purring up, rubbing her arched back caressingly against my knee, when she got her eyes on the birds. She seized one in her teeth, and started to make off with it to the bushes. I seized her by the tail and attempted to take the bird from her, when all her wild instincts sprang into instant play. Her fur turned the wrong way, her tail bushed out, her sharp white claws were displayed, while her eyes blazed with fury. Fighting like a demon, she clung to the grouse with her sharp teeth. I became thoroughly indignant, lifted her aloft, and banged her down on a log with considerable force; so heartily, indeed, that the grouse rolled into the bushes. After the trouble was over, she calmed down into the same old serene and complacent, purring pussy, showing no malice — in fact, seeming to forget all about the matter."

The Lynx is found as far south as the Adirondack Mountains. In the Adirondacks, where it is nowhere common, it preys, according to Dr. Hart Merriam, "upon the northern hare, and such other small mammals as it can catch, and upon the ruffed grouse and spruce partridge. It has been known to devour pigs, lambs, and young fawns; but the accounts of its attacking full-grown deer are not to be credited. Its haunts are in the deep forests and bush districts, remote from the paths of man; and consequently it rarely intrudes upon the barnyard. Its ordinary gait when in a hurry is a long gallop, like that of the hare, and it is said to swim well. The female commonly has two young at a birth, her lair being located in a cavern or hollow tree."

When leaping over the ground, with back arched, and tail so short as to be almost indiscernible, it presents an appearance that has been described by hunters and backwoodsmen as laughable and peculiar in the extreme.

The Lynx is seldom hunted systematically, as are other game animals, unless it be by professional hunters or trappers, who value it for the pelt. With them the usual method is to hunt it with dogs trained to follow the trail by scent. In other cases the track is followed through the snow, but hunters following such a lead must be prepared for a long arduous chase of many hours, because of its combination of cunning, agility, and endurance.

WILD CAT

Lynx ruffus (*Güldenstaedt*)

Other Names.— Bobcat, Bay Lynx, Red Lynx.

General Description.— Very similar to Canadian Lynx q. v. but rather smaller and with detailed differences. Form thick-set; legs long, tail short but longer than that of Canadian Lynx; ears prominent but not conspicuously tufted; feet large but smaller than those of Canadian Lynx; ruff of hair on side of head. General color pale rufous-brown, spotted on sides with dark-brown; fur soft and full.

Dental Formula.— Same as that given for Canadian Lynx.

Pelage.— Sexes similar. No very noticeable seasonal variation. ADULTS: Yellowish-brown above, spotted on sides with dark-brown; brown stripe on forehead and one on back and tail; underparts yellowish-white spotted with black; legs yellowish-brown spotted with black on outside, dull white on underside, barred with black; chin and throat whitish; breast white barred with black; two white bars across cheek; ears tipped with black; tail with broken bars of dark brown on upper surface, end spotted.

Measurements.— Length, 36 inches; tail, 6½ inches; hind foot, 7 inches. Weight, 20 pounds.

Range.— Central North America from southern Georgia to Maine.

Food.— Mammals and birds.

Remarks.— The Wild Cats form rather a larger group containing more species than are to be found in that section of the genus which contains the Canadian Lynx. They range over a much more diversified habitat and consequently more variations in size and color are met with. The distinguishing features between the Canadian Lynx and the Wild Cat have been set forth in the synopsis on the Lynx, as well as in the general characters outlined above. Some eleven species of Wild Cats are known from the Rio Grande northward.

RELATED SPECIES

Bay Lynx, or Wild Cat.— *Lynx ruffus ruffus* (Güldenstaedt). Typical animal of the above description. Eastern North America from southern Canada to the Gulf States.

Florida Wild Cat.— *Lynx ruffus floridanus* (Rafinesque). Feet smaller; darker in color; spotted. Florida.

Texas Wild Cat.— *Lynx ruffus texensis* (Allen). Chestnut brown above, spotted and sprinkled with black; size small. Texas and New Mexico to southern California.

Desert Wild Cat.—*Lynx ruffus eremicus* Mearns. A pale desert form. Above, grayish tawny olive, more or less mottled or spotted with brown or blackish, usually with pair of narrow interrupted black stripes on back; an indefinite whitish eye ring surrounding black eyelids; whiskers with several rows of small black spots at their bases; convex surface of ears black, with triangular pale gray spot; upper side of tail similar to back, with black tip, and one to six black bars; beneath grayish-white with black spot on inner side of limbs. A white, buffy or tawny band across breast; belly white, spotted with black. Central and southern California.

Northwest Wild Cat.— *Lynx fasciatus fasciatus* Rafinesque. Fur very full and soft. Color rich reddish chestnut-brown above; pale on sides and throat; belly white spotted with black; terminal third of tail black. Oregon and Washington.

Gray Wild Cat.— *Lynx fasciatus pallescens* Merriam. Smaller and paler than Northwest Wild Cat. California, Oregon and Washington.

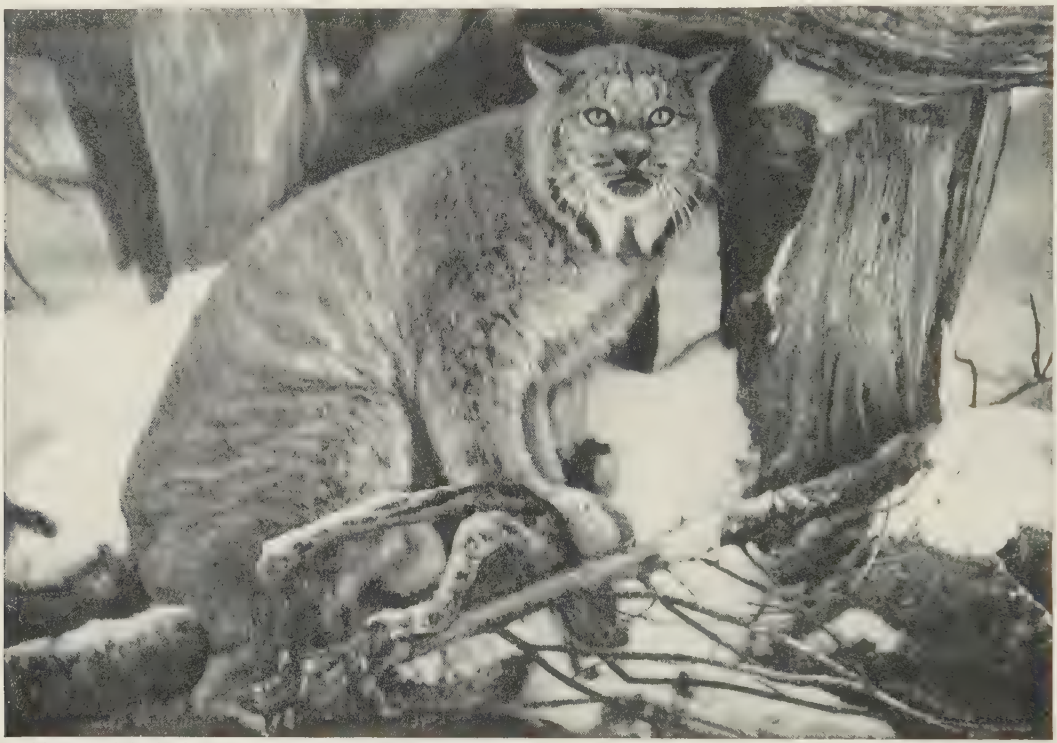
California Wild Cat.— *Lynx fasciatus oculeus* Bangs. Back dusky, lacking ferruginous color. Coast region of California north of San Francisco Bay.

Plateau Wild Cat.— *Lynx baileyi* Merriam. Like typical Wild Cat, but paler above and with shorter tail. Arizona.

Uinta Wild Cat.— *Lynx uinta* Merriam. Above buffy, grizzled with gray and black. No distinct spots above. Utah, Colorado, Wyoming.

Giant Bobcat.— *Lynx gigas* Bangs. Largest of the Lynxes. Nova Scotia.

The distinguishing feature of the Wild Cat is its short and rather bushy tail. Compared with the domestic cat, it stands somewhat higher, and has a coarser and rougher head. It is an inhabitant of the United States eastward of the Great Plains, with allied varieties in Nova Scotia, Florida, Texas, and California. Its fur, which is rather heavy and thick, is usually of a yellowish brown color with a reddish tinge, and a blackish stripe down the back; the under parts are white spotted with black. There are also spotted varieties.



Photograph by H. R. Wolmsley

WILD CAT

This fellow has been cornered, and while "Bob cats" do not usually show fight, it is well for the intruder to be wary

Wild Cats feed upon mice, squirrels, rabbits, grouse, and various small birds, and, not having the perseverance of the Weasel and Fox in pursuing, they lie in wait for their prey, springing out suddenly upon it. In settled districts they invade the farmyards, carrying off chickens, ducks, geese, and turkeys, as well as little pigs and lambs. As, however, they are first-class mousers, it is probable that they more than repay, by their destruction of noxious rodents, the depredations they themselves commit.

According to Stone and Cram, " when the Wild Cat hears the faintest movement in the underbrush, he instantly crouches with all four feet beneath him, and remains perfectly motionless, watching and listening, intent to learn whether it is an enemy to be avoided or possibly game for his dinner. In the latter case, he creeps forward with the utmost caution, planning, if possible, to head off his victim in order to seize it at the first alarm. When out hunting, the Bobcat utters a wild scream from time to time: its object evidently is to startle any creature that may be in hiding near by into betraying its presence by a startled jump. And certainly any animal would require strong nerves to remain unmoved when this jarring yell bursts through the stillness close at hand. It has been described as a low sort of growling, followed by a sudden, quick repeated caterwaul."

Wild Cats during most of the year hunt either alone or in pairs, and they do most of their roaming in the evening and morning twilights, sleeping during the day in the hollow of some tree, or in a cave, or even in the nest of a large bird. Their own nests, which are well-lined with moss, are found in hollow trees and logs. Their young number two to four.

The pelts of the Wild Cat have a ready sale among furriers. Dr. Merriam has eaten its flesh and pronounces it excellent. It is white, very tender, and suggests veal more than any other meat with which he is familiar.

The Texas Wild Cat is a large, dark, and much spotted cousin living in southern and eastern Texas. It is especially abundant "in the dense chaparral of cactus and mesquite along brushy stream bottoms and in the timbered gulches." Away from the towns the animals are most common in places where there is excellent cover such as is afforded by the thick part of the oak brush, where they can be hunted only with dogs, and in the great rose hedges, which are almost impenetrable.

Wild Cat hunting with dogs is a favorite sport in certain parts of the South. The hunters usually take their stands in open spots and wait for the dogs to drive the game within shot. The Wild Cat rarely trees, but usually, rabbit-like, runs round and round in a limited circle depending on outrunning or dodging the dogs. Mr. Bailey once shot a Wild Cat in front of the hounds as it passed him for the third time. "It did not seem tired or much alarmed, but easily kept out of sight of the dogs." When opened, "the stomach of this individual was full of venison that had not been perfectly fresh when eaten, probably from a Deer that had been wounded by some hunters a week before."

The Plateau Wild Cat gets its name from inhabiting the high plateau of Arizona, Utah, and Colorado. It is paler than the preceding, has a shorter tail, and a softer fur. It is found also in the mountains and Staked Plains regions of western Texas. Mr. Vernon Bailey, in whose honor Dr. Merriam named this species, writes ("A Biological Survey of Texas"): "The country occupied by this Plateau Wild Cat is mainly open, arid, and rocky. Canyons, gulches and cliffs are its favorite haunts, while caves and clefts in the rocks furnish dens and safe retreats from which hunting excursions are made. . . . Fresh tracks are frequently seen where the Cats have followed the lines of the cliffs, crept along narrow shelves of rocks from one wood rat's den to another, or walked noiselessly in the dust under and around the great boulders, where the cotton-tails hide. Most of the Wild Cat's hunting is done at night, but occasionally one is surprised at midday crossing a valley to another cliff, or found toward evening getting an early supper."

One January evening Mr. Bailey, while watching the hawks come into the cottonwoods to roost at sundown, saw "a pair of bright eyes among the branches overhead and slowly traced out the almost invisible form of a Wild Cat flattened along a rough gray branch." As he needed the specimen, he did not wait to see if hawks were the object of the Wild Cat's hunt, but soon secured it.

The Desert Wild Cat, another well-known species, is of a tawny hue which matches well with its barren surroundings. (See detailed description above). Its habits do not differ greatly from others, beyond the change necessitated by local conditions. It is a lithe, bloodthirsty animal that spends many of its waking hours stalking its prey.

Louis Agassiz Fuertes.

By permission of U. S. Biological Survey

PLATEAU WILD CAT

From a drawing by L. A. Fuertes, showing handsome markings of these Western cats

Says one observer: "While walking along a railroad track, I had an excellent opportunity to watch the method by which the Bobcat hunts Prairie Dogs. I was just emerging from a deep cut when I saw a large reddish Bobcat at a distance of not over forty feet. It was sneaking through the scattering greasewood bushes flat upon its belly, its short tail twitching nervously, and the excited chattering of the Prairie Dogs on a neighboring flat showed that its approach had been noted by the alert animals. One large old Prairie Dog in particular, apparently the Cat's intended victim, was seated at its burrow on the edge of the town, chattering in a bantering manner and appearing less frightened than the rest. The burrow was within leaping distance (about ten feet) of the edge of the greasewood, and in making its approach, the Cat took advantage of every bush, stopping in the cover of each for a few moments. When it reached the last bush and was gathering itself for the final leap, the old Prairie Dog disappeared, but only just in time, as in another moment the Cat landed on the rim of the burrow. Rapid, nervous jerks of the tail showed the Cat's disappointment as it glared about in different directions. Up to this time my presence had not been noted, and not until I had thrown several stones did the Cat see me, whereupon it bounded away across the Dog town in long leaps."

Photograph from the American Museum of Natural History

WILD CAT KITTENS

These small Lynxes were only a few days old when photographed

ORDER OF GNAWING ANIMALS

(*Rodentia, or Glires*)

THIS is a well defined group of the smaller animals, the commonest distinguishing character being the presence of broad chisel-like incisor teeth adapted for gnawing. Such well-known animals as the Rats, Mice, Squirrels and Hares belong to this order, and it is by far the largest of all in point of numbers. They are found practically all over the world.

Rodents have other well-marked traits. The eyes are sharp and bright, the ears well developed. There are no canine teeth, which leaves a gap between the incisors and the molars, and the molar teeth have special adaptations for grinding. The lower jaw is hinged with the skull in such a manner that movement is possible not only up and down, but backward and forward as well, and sidewise to a certain degree. This feature allows the best play of the teeth of the opposing jaws across one another in order to secure grinding of the vegetable fiber. The Rodents live very largely on vegetable food.

The members of this order are fitted for every conceivable nook in nature's economy, for Rodents are found in the trees, on the ground, under its surface, and in the water. One species of the Squirrel family almost flies through the air. For convenience, the order is divided into the sub-order *Simplicidentata* (all Rodents but Hares and Pikas) and the sub-order *Duplicidentata* (Hares and Pikas). These sub-orders are distinguished by the difference in number of the gnawing teeth, the incisors. The Hares and Pikas have four incisors in the upper jaw, a main pair of large ones with enamel extending all around the tooth, and a second pair of small incisors directly behind them. The other Rodents have but one pair above, and the enamel is confined to the cutting face of the tooth.

The following table shows the division of Rodents into families and species in this country:

ORDER OF GNAWING ANIMALS (RODENTIA)

FAMILIES

(In North America)

- Squirrels (*Sciuridæ*)
  - (Typical species)
  - **Gray Squirrel**
  - **Red Squirrel**
  - **Fox Squirrel**
  - **Tuft-eared Squirrel**
  - **Flying Squirrel**
  - **Spermophile**
  - **Chipmunk**
  - **Marmot**
  - **Prairie Dog**
- Sewellels (*Aplodontiidæ*)
  - (Only species)
  - **Sewellel**
- Beavers (*Castoridæ*)
  - (Only species)
  - **Beaver**
- Porcupines (*Erethizontidæ*)
  - (Only species)
  - **Porcupine**
- Rats and Mice (*Muridæ*)
  - (Typical species)
  - **House Rat**
  - **Wood Rat**
  - **Cotton Rat**
  - **Rice Rat**
  - **House Mouse**
  - **White-footed Mouse**
  - **Lemming Mouse**
  - **Meadow Mouse**
  - **Red-backed Mouse**
  - **Musk-Rat**
- Conies (*Ochotonidæ*)
  - (Only species)
  - **Pika**
- Hares (*Leporidæ*)
  - (Typical species)
  - **Arctic Hare**
  - **Varying Hare**
  - **Jack Rabbit**
  - **Pygmy Hare**
  - **Cottontail**
  - **Swamp Rabbit**
- Pocket Gophers (*Geomyidæ*)
  - (Only species)
  - **Pocket Gophers**
- Jumping Mice (*Zapodidæ*)
  - (Only species)
  - **Jumping Mouse**
- Pocket Rats (*Heteromyidæ*)
  - (Typical species)
  - **Pocket Mouse**
  - **Pocket Rat**

THE SQUIRREL FAMILY

(*Sciuridæ*)

WHO does not know and like the Squirrels? Busy, frisking, bright-eyed and graceful, they are among the most interesting neighbors of the woodland. In our public parks they easily become so tame as to approach the passer-by and "hold him up" for food. And yet the Squirrels if unrestricted might become a pest. Their gnawing habits and their tendency to rob birds' nests are points against them. In England they have not been protected or made such pets, as in this country.

Members of this family include the Squirrels, Flying Squirrels, Ground Squirrels, Chipmunks, Marmots, and Prairie Dogs. Their chief family resemblances are rounded and bushy tails which are never scaled. They have twelve or thirteen ribs. Their first upper premolar teeth are very small. The family is a large one with members widely scattered.

EASTERN GRAY SQUIRREL

Sciurus carolinensis *Gmelin*

General Description.— A large, bushy-tailed arboreal Squirrel. Head rounded; ears of moderate height, covered with short hairs; body large but not heavy; tail about half the total length, very broad and bushy; legs fairly short; color yellowish-rusty above; white below; pelage soft. An animal of much more quiet behavior than the Red Squirrel.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{2-2}{1-1}$; Molars, $\frac{3-3}{3-3} = 22$.

Pelage.— ADULTS: Sexes similar. *Summer.* Above dark yellowish-rusty; hairs on tail yellow at base, then black, finally tipped with white; underparts white; ear yellowish-white; soles of feet usually naked. *Winter.* Much the same. YOUNG: Uniformly grayish.

Measurements.— Total length, 18 inches; tail vertebrae, 8.5 inches; hind foot, 2.51 inches.

Range.— Eastern United States from southern New York to northern Florida, west to Indiana, Missouri, and Oklahoma.

Food.— Nuts and acorns.

RELATED SUBSPECIES

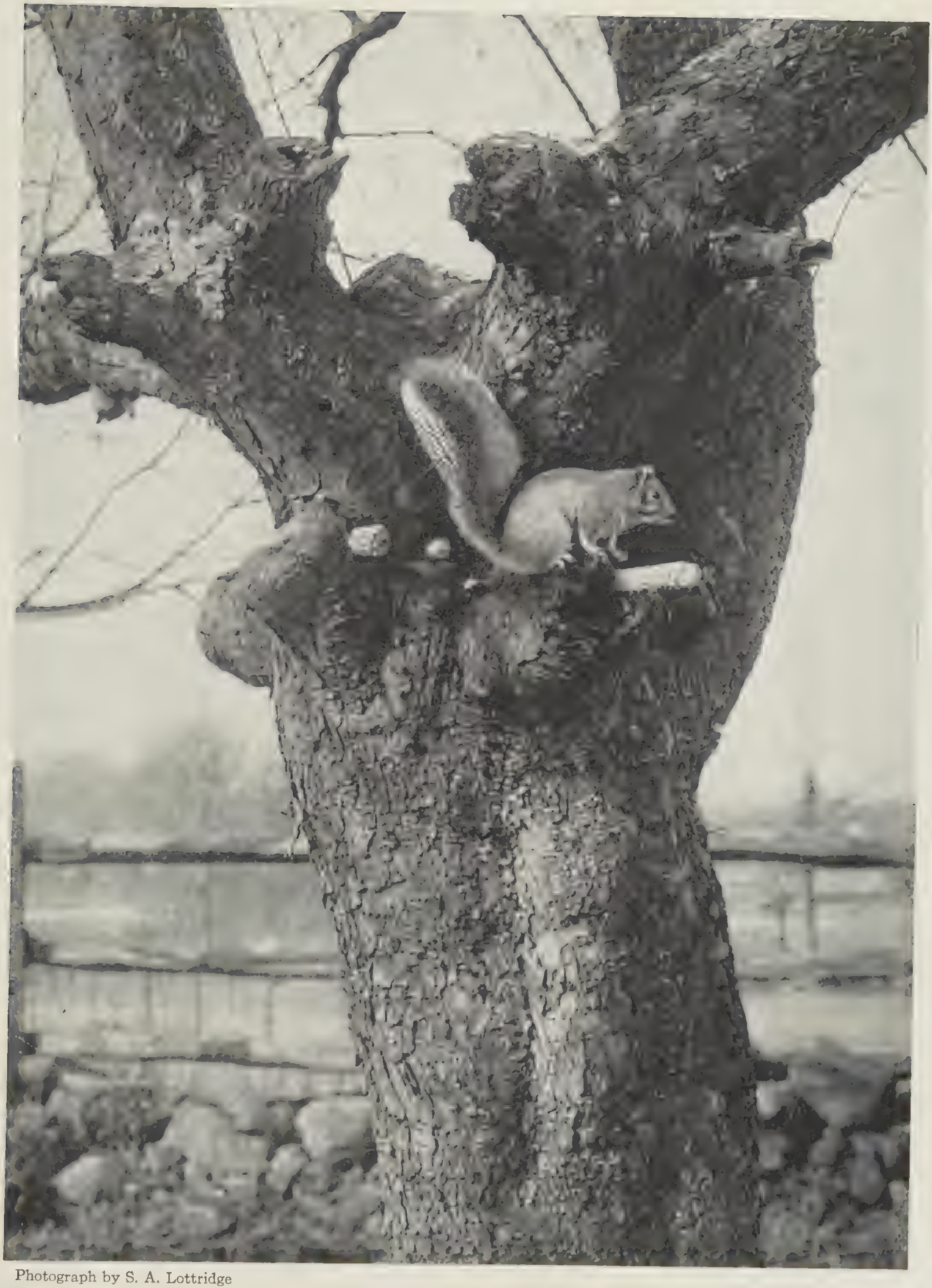
Eastern Gray Squirrel, or Carolina Gray Squirrel. — *Sciurus carolinensis carolinensis* Gmelin. Typical form of the above description. Timbered regions from Florida north to lower Hudson Valley, west through the Alleghenies south of Pennsylvania to Indiana, Missouri, Oklahoma and the edge of the Plains.

Northern Gray Squirrel.— *Sciurus carolinensis leucotis* (Gapper). Larger and grayer; black individuals not uncommon in this variety. Northeastern United States and southern Canada from Illinois, Indiana and Pennsylvania northward to 46° latitude, and west to Minnesota and Iowa.

Florida Gray Squirrel.— *Sciurus carolinensis extimus* Bangs. Smallest of Eastern Gray Squirrels. Color lighter and grayer than Carolina Gray Squirrel. Southern Florida.

The Eastern Gray Squirrels range from New York south along the entire Atlantic seaboard and as far west as the edge of the Plains. The group is divided into five sub-species, based mainly on color characters and size differences. Some of these sub-species have a black color phase or melanistic form in which the animal is black all over, but these are rarer.

The home of the Gray Squirrel in the East is usually to be found in the hollow of a maple, birch, or beech tree, with the entrance among the branches forty to sixty feet from the ground.



Photograph by S. A. Lottridge

EASTERN GRAY SQUIRREL

The Gray Squirrel may be readily tamed, and is a familiar and pleasing inhabitant of many city parks

In the West it frequents the oak and pine. This is the real home, although often a summer house is constructed, which is generally located in the same tree with the other home, so that if the Squirrel becomes frightened, it may run for shelter to the more secure dwelling in the hole of the tree. The summer home may be built for convenience during the time that the young are being reared; perhaps, it is built for sanitary reasons; the temperature may be very much less during the hot weather; or it may be a pleasure house, for a tenting-out period that is so much enjoyed by some of the higher animals. Who knows? The material of the summer house varies considerably, but consists chiefly of sticks, bark, leaves, with a lining of grasses or some other material. The entrance is on the side, the nest from below resembling that of a crow.

The Gray Squirrels do not lay up for winter use quantities of nuts or other food, as do the Chipmunks, for they do not hibernate. When the weather is not severe they roam abroad during the winter. However, the Gray Squirrel, in common with most of our other Squirrels, has the habit of digging holes and hiding a nut or two here and there. It has been argued that this is an idle pastime, and that nuts so concealed in many places could never again be located by the Squirrel, but it must be remembered that the sense of smell is very acute, probably guiding the animal more than memory. It must be this wonderful sense of smell that directs the Squirrel where to dig in the snow, securing from beneath the leaves the nuts that were buried weeks before; or that guides him to a solitary nut tree, or to the grain in a barn.

This stored food constitutes only a part of the Gray Squirrel's winter supply. The other part he must scurry about to find. The beech trees and some others do not drop all of their nuts

Photograph by H. E. Anthony

EASTERN GRAY SQUIRREL

The home of the Eastern Gray Squirrel is usually to be found in a hollow tree, forty feet or more from the ground

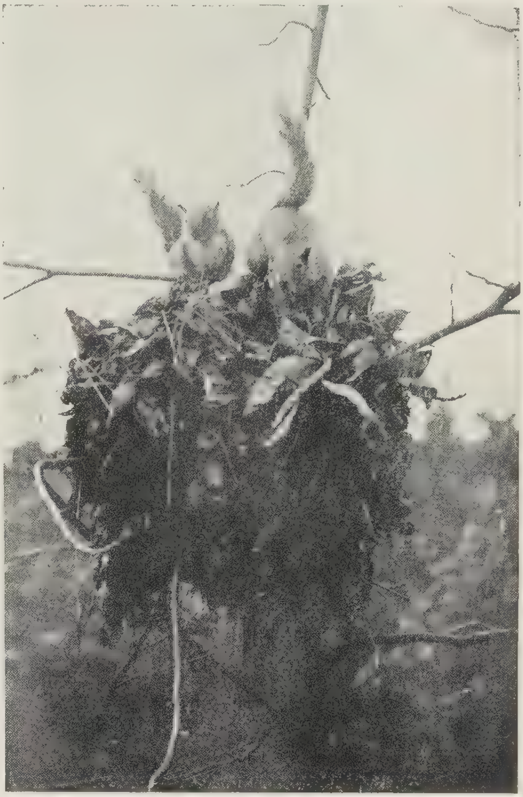
at the approach of winter. There still hang a few solitary nuts on each tree, and through a large beech forest the number so left is considerable. But the Gray Squirrel is not the only claimant for the nuts; the Red Squirrel and the red-headed woodpeckers demand the lion's share. The birds seem to think that these nuts are exclusively their property, and vigorously do they protest if a Squirrel appears. One determined woodpecker will sometimes send a Gray Squirrel scampering after a few moments, for the blows from that long sharp bill of his are severe. The Squirrels, being the earlier risers, are often feasting when the birds appear, but they beat a hasty retreat before these tri-colored warriors.

Photograph by Glen Corley

"UP A STUMP"

This Gray Squirrel has evidently found a table ready set to his liking

The Gray Squirrel has other enemies in feathers, such as the goshawk and the red-tailed hawk. A single hawk, however, can scarcely catch a Gray Squirrel, especially if the Squirrel remains on the tree trunk, which he probably will be wise enough to do, thus being enabled, by dodging, to evade the hawk's claws. The writer never witnessed an encounter of this kind but once, and certainly the Squirrel was "up to the trick;" for he eluded the hawk in the most exasperating manner, chattering and barking the while in a most impudent tone. "Qua-qua-qua-qua-qua-a-a!" The hawk was angry, the feathers on its head and neck being ruffled as was its spirit. At last it was obliged to retire, leaving the Squirrel at his hunting. I have been informed, however, that the Squirrel does not always get off so nicely, for sometimes the red-tails hunt in pairs, and then the Squirrel has no chance for his life.


Photograph by H. T. Middleton

READY FOR HOUSEKEEPING

A pair of Gray Squirrels have just completed a handsome home, and are ready to move in

Gray Squirrels have a good ear for music, says Dr. C. Hart Merriam, who mentions some experiments with Squirrels which frequented a box of nuts that his father supplied for them during the winter: "They were extremely fond of music, and it affected them in a peculiar manner. Some were not only fascinated, but actually spellbound, by the music-box or guitar. And one particularly weak-minded individual was so unrefined in his taste that if I advanced slowly whistling, 'Just before the Battle, Mother,' in as pathetic a tone as I could muster for the occasion, he would permit me even to stroke his back, sometimes expressing his pleasure by making a low purring sound. This was a Gray, and I several times approached and stroked him as above described. I once succeeded in getting near enough to a Black to touch him, whereupon he instantly came to his senses and fled. When listening to music they all acted in very much the same way. They sat bolt upright, inclining a little forward (and if eating a nut, were sure to drop it), letting the forepaws hang listlessly over the breast, and, turning the head to one side in a bewildered sort of a way, assumed a most idiotic expression."

The Gray Squirrel is readily tamed, or semi-tamed and lives contentedly in the city parks. It will come close to the visitor and may be even persuaded to climb one's coat and eat out of the hand. When alarmed, it utters a peculiar rasping cry or bark. It is an arrant coward, being readily driven off by its smaller red cousin.

The family of the Gray Squirrel is usually five in number. The parents are quite devoted and work early and late to feed their youngsters and to provide stores for the winter.

Two families of Gray Squirrels dwelt in amity near the writer's home, until one day a great chattering was heard. The smaller pair of the two were quarreling vociferously with the older ones. What the cause was, none of the "innocent bystanders" knew; but the outcome was easily seen. The older pair decided to move out, and lost no time in acting. They chose an oak tree at least five hundred yards away and the mother Squirrel carried each baby by the back of the neck, much as a cat carries a kitten, down the road and up the tree. Five separate trips were made and all were safely transferred, after which the neighborhood was at peace.

S. A. Lottridge.

WESTERN GRAY SQUIRREL

Sciurus griseus *Ord*

General Description.— Of similar proportions and general appearance to the Eastern Gray Squirrel, but larger, with very large tail.

Dental Formula.— Same as Eastern.

Pelage.— Adults: Sexes similar. Seasonal variation slight. Above, general color mouse-gray, thickly grizzled with white; dull white eye ring; ears never tufted, light-brown at base, dusky at tip; no lateral stripe; undersurface white meeting ashen-gray hue of the sides in a sharply defined line; tail slate-gray mixed with whitish, the hairs tipped with white; undersurface of tail pale ashy-gray centrally, with blackish lateral bands and fringed with white; limbs ashy-gray externally. Young: Similar to adults.

Measurements.— Total length, 22 inches; tail vertebrae, 11 inches; hind foot, 3.1 inches; ear from crown, 1.18 inches.

Range.— Western Washington, Oregon and northern California.

Food.— Seeds of conifers, especially of the pine, and acorns.

Related Subspecies

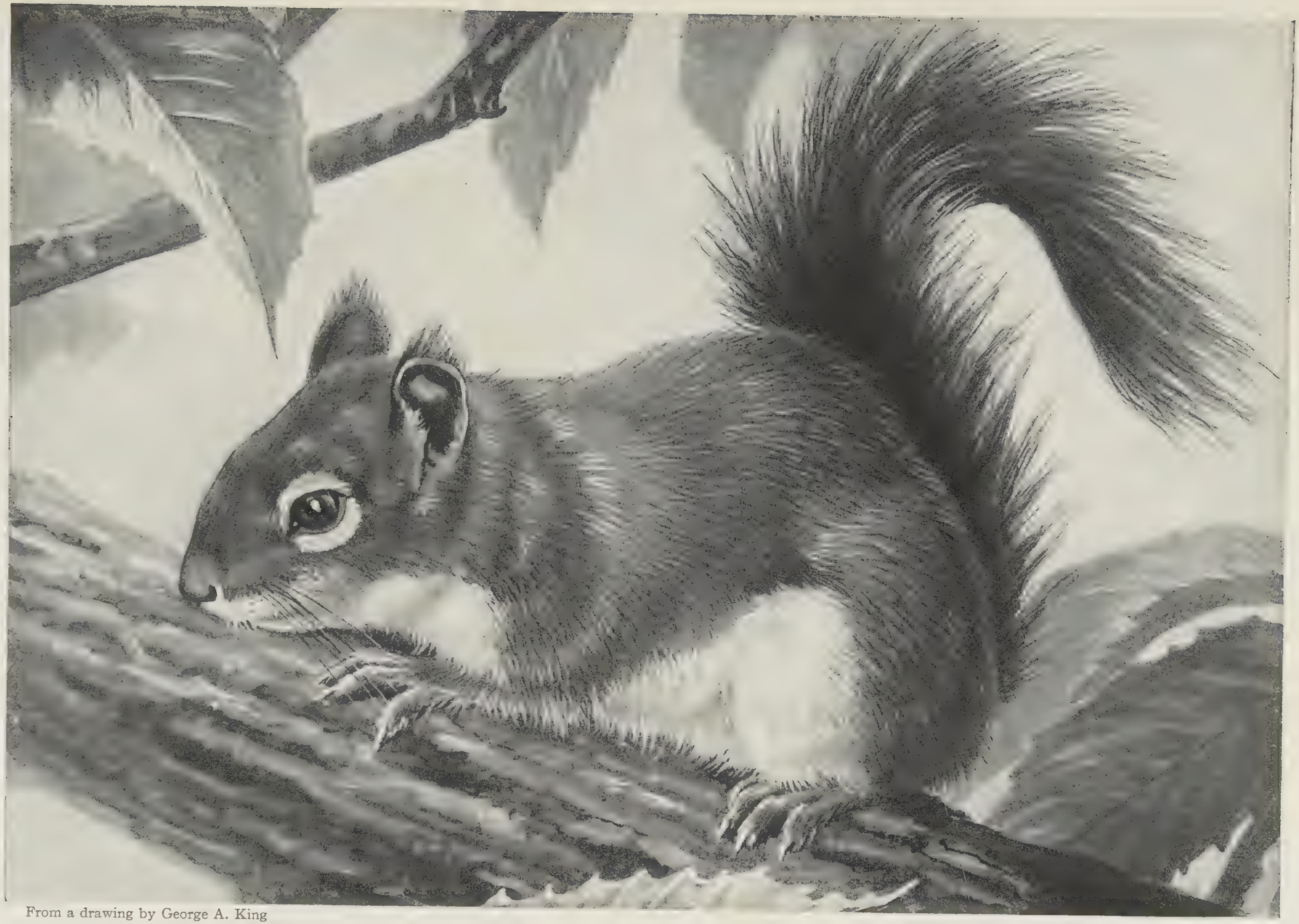
Western Gray Squirrel, or Columbia Gray Squirrel. — *Sciurus griseus griseus* Ord. Typical animal as described above. Pine and oak forests from southwestern Washington through western Oregon, and most of California.

Black-footed Gray Squirrel.— *Sciurus griseus nigripes* (Bryant). Darker than Western Gray Squirrel. Upper surface of feet slaty or black. From San Francisco southward into Santa Cruz Mountains.

Anthony Gray Squirrel.— *Sciurus griseus anthonyi* (Mearns). Intermediate in color between Western Gray Squirrel and Black-footed Gray Squirrel. Higher mountains of southern California.

The Western Gray Squirrels are noticeably larger and more striking in appearance than the Eastern. The tail is especially long and bushy, and the gray color of the upper parts is much clearer than in the eastern animal. Cranial characters are the basis for placing this animal in a subgenus apart from the Eastern species. This is a small group and has but three subspecies differing mainly in the color of the feet.

The habits of the Western Squirrels are much the same as those of their Eastern cousins. As a rule they are wilder, since they do not dwell near closely settled communities. They prefer the depths of the great pine and oak forests, and are fond of pine seeds and acorns. In the cavities of these trees well up from the ground they rear their families and lay by their winter stores. And always they are on the alert for their enemies,— the greedy Mice; the prowling Red Squirrel; the Hawk above; and the Fox below.



From a drawing by George A. King

EASTERN RED SQUIRREL

The typical markings of this large group of Squirrels are chestnut or reddish brown above, and pure white underneath. The related species are found throughout the United States and Canada, wherever there is timber

EASTERN RED SQUIRREL

Sciurus hudsonicus (*Erxleben*)

Other Names.— Chickaree, Pine Squirrel.

General Description.— A medium-sized Squirrel with bushy tail. Head blunt and rounded; ears fairly large and broad, clothed with short hair; body of moderate proportions; tail nearly as long as head and body, broad and bushy; feet of moderate length, soles furred, pads naked; general color above yellowish-rufous in summer, chestnut rufous in winter. Temperament, nervous and active.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{2-2}{1-1}$ or $\frac{1-1}{1-1}$; Molars, $\frac{3-3}{3-3} = 20$ or 22.

Pelage.— ADULTS: Sexes identical. *Summer.* Upper parts yellowish-rufous; a conspicuous black lateral line between rufous of upper parts and clear white of under parts; everywhere below, pure white; no tufts on ears; tail above like body, beneath, yellowish-gray bordered with black and fringed with yellowish-rufous; upper surface of hind feet and front of fore legs clear ferruginous. *Winter.* Upper parts and dorsal stripe, chestnut rufous; sides olivaceous gray; under parts grayish-white; tail as in summer but fuller; short tufts of hair on ears. YOUNG: Similar to adults but coloration weaker.

Measurements.— Total length, 12 inches; tail vertebrae, 5.5 inches; hind foot, 1.8 inches.

Range.— Boreal North America, Labrador west to Rocky Mountains and Alaska.

Food.— Seeds of conifers and of other plants, nuts, buds, some insects and birds' eggs.

RELATED SPECIES

Eastern Red Squirrel, or Eastern Chickaree.— *Sciurus hudsonicus hudsonicus* (Erxleben). Typical animal of the above description. Boreal North America north of the United States.

Southern Red Squirrel.— *Sciurus hudsonicus loquax* Bangs. Larger than Eastern Red Squirrel; tail longer; dorsal stripe brighter. Ontario to North Carolina, and west to Minnesota.

Little Red Squirrel.— *Sciurus hudsonicus gymnicus* Bangs. Smallest of the Eastern Red Squirrels; tail with orange-red fringe. Eastern North America south of Labrador to northern New York, west to northern Michigan and northern Minnesota.

Richardson's Chickaree.— *Sciurus hudsonicus richardsonii* (Bachman). Upper surface of tail mostly black, size large. Northern Montana, Idaho, northeastern Washington, and Oregon northward into British Columbia.

Douglas's Chickaree.— *Sciurus douglasii douglasii* Bachman. See special synopsis.

Fremont's Chickaree.— *Sciurus fremonti fremonti* Audubon and Bachman. See special synopsis.

The Red Squirrel in some of its related forms is found in nearly every timbered area in North America. This group of medium-sized Squirrels is divided naturally into several subgroups clearly distinguished by strong color differences. Altogether about twenty species and subspecies of Red Squirrels range north of the Rio Grande and fall easily into three divisions: the first, or Eastern Red Squirrel group in which all the members are clear white below and generally some tone of chestnut, or rufous brown above; the Douglas Red Squirrel group in which the members are bright orange below and reddish above; and the Fremont's Chickaree group in which the members are grayish white below and gray above.

The Red Squirrel is the most frolicsome, alert, curious, and " sassy " of the family to which he belongs. His home is usually in a hollow tree or among the roots, but sometimes he constructs a summer nest of twigs and leaves, located on lofty branches in the forest; but if in an old apple tree, it is usually not more than fifteen feet from the ground.

Nuts form the chief food of the Red Squirrel, but berries, roots, fungi, fruits, seeds of the pine, and, occasionally, animal food, are also eaten. Even in the coniferous forests he, with his intelligence, industry and faculty of adapting himself to circumstances, lives and thrives. If the annual nut crop fails, the other Squirrels are forced to migrate; not so with the Red Squirrel, or Chickaree, as he is often called, for he can subsist upon buds, roots, and even mushrooms — in fact, he is very fond of the last named. Just how a Red Squirrel knows the difference between the poisonous and the nonpoisonous varieties has always been a mystery. Mushrooms decay quickly if not gathered at the proper time, and the Red Squirrels, who know this as well as we do, harvest them accordingly. There are also the barberries, chokecherries, partridge berries and greenbrier berries which they add to their store, and last, but quite important in many localities, are the seeds from the cones of the hemlock, pine and spruce.

But the food question is far from being settled for the Red Squirrel, even after the supply which has cost him days and days of arduous toil is gathered, for he has thieving neighbors constantly watching to take advantage of his thrift. He suffers little from his own kind, for each Red Squirrel is supposed to have a certain territory that belongs to him, and trespassers upon another's preserves are promptly driven away; also he easily vanquishes his larger cousin, the Gray Squirrel, but there are many other hungry wood folk not so easily disposed of, such as the thieving blue jays, which know neither bounds nor limits, and which are ever on the alert for tempting morsels. The Red Squirrel has learned through bitter experience that it is better to have various storehouses for his supplies. Nature and stern necessity have taught him to make ample provisions in the season of abundance for the long winter that is to follow, and the quantity of food stores is often quite large. Sometimes as much as a bushel and a half of nuts have been taken from a hollow tree occupied by a pair of Red Squirrels. This probably was the main storehouse, but undoubtedly there were lesser ones which would have considerably increased the amount.

Annoying as the blue jay is, he is a real friend to the Squirrels and other wood dwellers. The Red Squirrel, being a constant target for gunners in some localities, is very shy, and the jay often sounds an alarm note when the hunter is some distance away, thus warning the Squirrel in time to scamper away and hide until the danger is past. The blue jay, and in the northland the Canada jay, have caused the hunters to lose many a good shot, not only at small game, but more particularly at members of the Deer family.

The Red Squirrel is an expert on the subject of nuts, not only in selecting sound and good ones, but also in the manner and certainty with which he gets at the kernel. Concerning this art John Burroughs writes as follows: " There is one thing that the Red Squirrel knows unerringly that I do not know (there are probably several things); that is, on which side of the butternut the meat lies. He always gnaws through the shell so as to strike the kernel broadside, and thus easily extract it; while to my eyes there is no external mark or indication in the form or appearance of the nut, as there is in the hickory-nut, by which I can tell whether the edge or the side of the meat is toward me. But examine any number of nuts that the Squirrels have rifled, and, as a rule, you will find they always drill through the shell at the one spot where the meat will be most exposed. Occasionally one makes a mistake, but not often. It stands them in hand to know, and they do know. Doubtless, if butternuts were a main source of my food, and I were compelled to gnaw into them, I should learn, too, on which side my bread was buttered."

Photograph by the U. S. Biological Survey

FREMONT'S CHICKAREE

Also called Pine Squirrel, from its fondness for pine and spruce cones. This was a young specimen

In certain parts of the country the Red Squirrel makes inroads upon the farmer's storehouse of grain, and sometimes it ventures even so far as to make a nest for itself in some of the outbuildings.

Although the Red Squirrel is a good provider, food sometimes becomes extremely scarce in the north country, if the spring is very late, and his hunger drives him to drink. He does not slake his thirst at the mountain stream, but taps a maple tree and later the birch. With his sharp, chisel-like teeth he makes an incision in the bark, either upon the tree trunk or upon the upper side of a limb. The cut in the bark forms a small cavity, in which the sap collects, and as the capacity is small, there may be two or three " drinking fountains " on the same tree.

He is abroad at nearly all times of the day, but retires early, except in the busy nutting season, when he keeps late hours. This Squirrel combines qualities so entirely dissimilar that he is clearly the enigma of the forest. His wonderful inquisitiveness, his exasperating insolence, coupled with all disregard for the ordinary civilities of the wood folk, stamp him " the black sheep of the flock." If you disturb him in your walk, he mounts the nearest tree, and from a limb just out of reach he literally boils over with rage and indignation, jerking his tail and stamping the limb furiously, calling *" chickaree, chickaree, chickaree!"* He barks and spits, and probably says things in Squirrel language that would sound very dreadful in English. He makes little dashes first this way, then that, as though he intended to come down the tree and run you from the premises. He has no more respect for a man than for a dog, and if you sit down and remain motionless, he may either pay no attention to you at all, or his insolence may know no bounds, so fickle and changeable is his disposition.

Those who have tented in the woods far removed from man's influence, must have observed the ungovernable curiosity of the Red Squirrel. Within ten minutes after your camping outfit was landed, he was chattering at you from the tree tops. If he considered you a " squatter " upon his territory, his language indicated it, but if pleased, his every action showed his approbation. Many a time I have been awakened in the early morning by the repeated calls and chuckles of this clown of the forest; nor was he always satisfied in remaining on the outside of my tent, for if I did not appear at what he believed to be the proper time, he might surprise me by coming inside. If you really would like to have him come in, a nut dropped near the entrance would seem to assure him that you were his friend, and the ice once broken he visits you regularly during your stay, accepting food of almost any kind. A few weeks of this, and you become very much attached to the mischievous little rascal, and after camping days are over, the recalling of his escapades is a pleasant memory.

This same curiosity that endears him to some campers makes him a terror in the region of the trappers. Says one observer: " From an overhanging limb he looks on with unfeigned interest while the trapper arranges the bait for the Marten or Fisher; but a moment later he has sprung the trap and is chippering with a fiendish delight. He is often caught, it is true, but a half dozen others are always ready to take his place, and it affords little satisfaction to the hunter, on his lonely rounds through the snow-clad forest, to find a worthless squirrel in his trap, instead of the valuable fur for which it was set."

Many claim that the Red Squirrel is the bird's most deadly enemy, destroying both eggs and young; others are equally positive that the Squirrel does not meddle with nesting birds. I do not precisely agree with either, for circumstances have very much to do with it, and to say that the Red Squirrels as a whole do not rob birds' nests is a very sweeping statement. There are probably both innocent and guilty ones. In other words, I believe it to be largely a habit, formed like any other habit that an animal may have, or that persons may have.

Photograph by H. T. Middleton

CHICKAREE

Holding almost as big a nut as he can manage

Yet, with all his many faults and objectionable traits, his intelligence, his wonderful perseverance, his industry, and the cleverness displayed in his various actions cause him to be tolerated, even though he is an acknowledged nuisance.

S. A. Lottridge.

DOUGLAS'S CHICKAREE

Sciurus douglasii *Bachman*

General Description.— General build as in Eastern Red Squirrel, but coloration strikingly different. Above, dark gray; below, orange.

Dental Formula.— Same as Eastern.

Pelage.— ADULTS: Sexes similar. *Summer.* Olivaceous brown, tinged with reddish, above; orange of variable intensity, below; feet, orange rufous; lateral line conspicuously black; tail above, dark ferruginous with sub-terminal broad black bar; tail fringed with yellowish; underside grizzled rusty. *Winter.* A dark reddish dorsal band; rest of upper parts dark gray; underparts orange grizzled with black; lateral line present; tail as in summer but thicker. YOUNG: Similar to adults but colors weaker.

Measurements.— Total length, 14 inches; tail vertebrae, 5 inches; hind foot, 2 inches.

Range.— Coast region of Oregon and Washington from Cape Blanco to Puget Sound.

FREMONT'S CHICKAREE

Sciurus fremonti *Audubon and Bachman*

Other Name.— Pine Squirrel.

General Description.— Proportions and size about as in Eastern Red Squirrel, but coloration much grayer.

Dental Formula.— Same as Eastern.

Pelage.— ADULTS: *Summer.* Above yellowish-gray; forearm and upper surface of feet ochraceous; lateral line black; beneath, grayish-white; tail above, yellowish-rusty bordered with black and fringed with white; beneath, pale yellowish gray bordered and fringed as above. *Winter.* Above, gray with pale yellowish-rufous dorsal band and obscure dusky lateral line; underparts grayish-white; tail as in summer but thicker. YOUNG: Much the same markings as found in adults.

Range.— Rocky Mountains of Colorado, and Uintah Mountains in Utah.

Photograph by H. T. Middleton

YOUNG CHICKAREES

The Red Squirrel, or Chickaree, is the most frolicsome and also the most quarrelsome of the Squirrel tribe. It will not hesitate to tackle and drive off its larger gray cousin

The Douglas, and the Fremont Red Squirrels are western types which differ in coloration, but only slightly in habits. Mr. Merritt Cary, of the U. S. Biological Survey says: "Like the common Northern Red Squirrel, which it greatly resembles in all respects except color, the Fremont Squirrel feeds chiefly upon pine and spruce cones, which are hoarded in large caches at the bases of trees, beneath logs, and among rocks. I have never found it living in a hollow tree, although it may do so occasionally. The nests of pine or spruce needles and fine strips of bark are usually constructed in the fork of a branch well out from the main trunk, at from twenty to forty feet above the ground, and in the densest forest. I have found the nests occupied by the Squirrels in both summer and winter. This Squirrel is not at all shy, and may be coaxed to within a few feet by making a nondescript, 'screaping' noise. One seen in August was laboriously ascending a tree, carrying a large cantaloupe rind, which had been left by a camper. In some localities it is called the little Gray Squirrel, which is, of course, a misnomer."

The Red Squirrel has many enemies, and of these the most deadly are the hawk, the owl, and the Weasel. The Weasel is the most relentless of all, and by his sense of smell pursues the Squirrel through the tree tops. The Squirrel is much fleeter, but for some reason not known, he seemingly goes crazy when he discovers the Weasel on his trail, and rushes pellmell among the tree tops, up and down, crossing and recrossing his trail, until at last, hiding among the branches or taking to a cavity, he awaits the coming of the Weasel, which means nothing less than sure death.

FOX SQUIRREL

Sciurus niger *Linnaeus*

General Description.— Largest of the North American arboreal Squirrels. Head large, blunt, rounded; ears of moderate height, rounded; body large, fairly heavy; tail about one-half total length, broad and bushy; legs short; pelage harsh; color varying from glossy black to clay color mingled with black.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{1-1}{1-1}$; Molars, $\frac{3-3}{3-3} = 20$.

Pelage.— ADULTS: Sexes similar. Seasonal variation not especially noticeable. General color above, from glossy black to clay color mingled with black; clay color below; tail mixed black and clay color; nose and ears always white; top of head usually black. YOUNG: Colors not so strong as in adults.

Measurements.— Total length, 25.5 inches; tail vertebrae, 12 inches; hind foot, 3.5 inches.

Range.—Virginia to Florida, east to Alleghenies, and Gulf Coast to Louisiana.

Food.— Nuts and seeds of trees with some buds, fruit and berries.

Remarks.— The Fox Squirrels may be known from the other North American Tree Squirrels by their large size, heavier bodies and distinctive coloration. About five species and subspecies are known in the United States.

RELATED SPECIES

Fox Squirrel, or Black Fox Squirrel.— *Sciurus niger niger* Linnaeus. Typical animal as described above. Florida and the southeastern States.

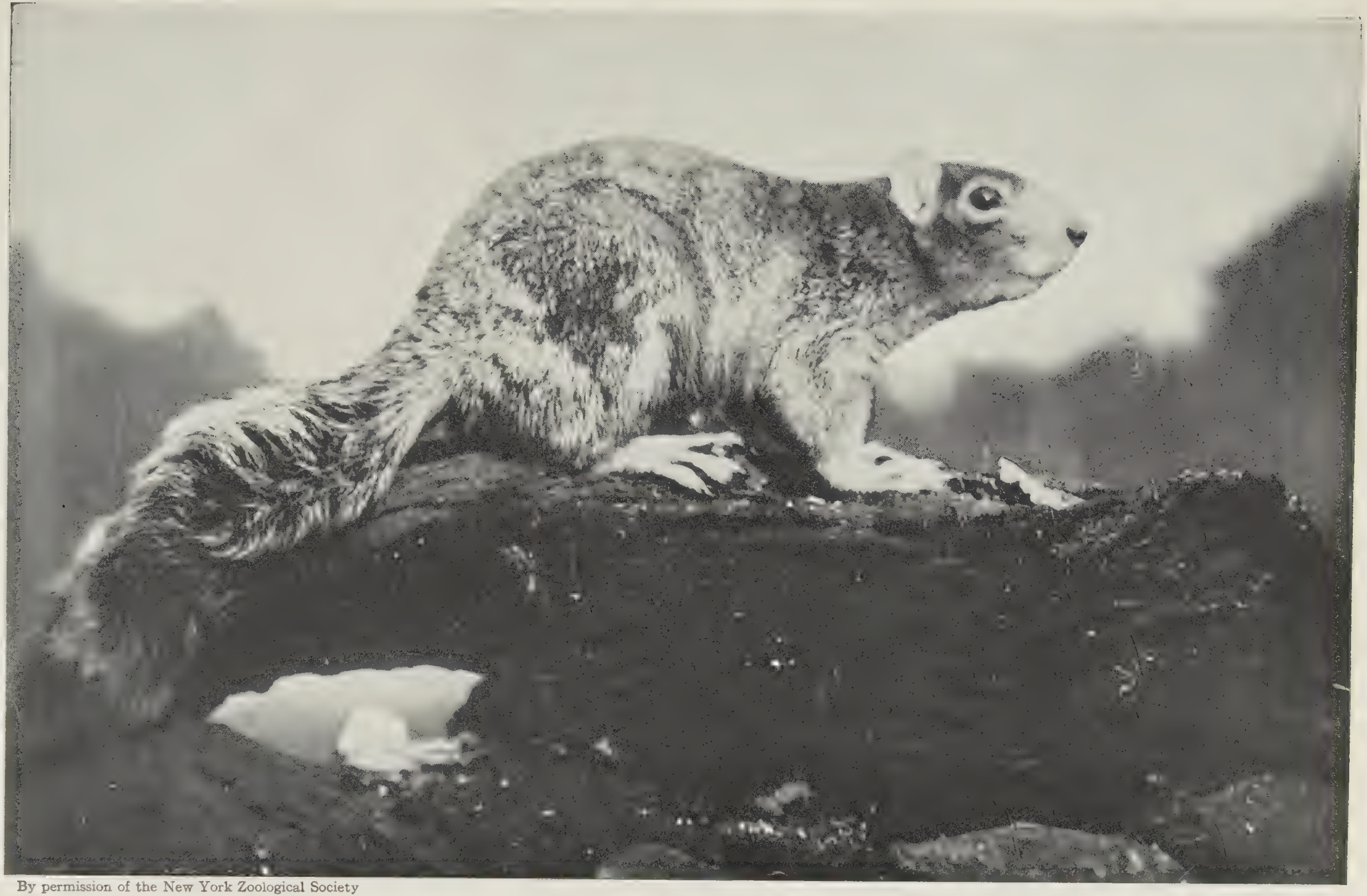
Yellow-bellied Fox Squirrel.— *Sciurus niger rufiventer* (Geoffroy). Smaller than the Black Fox Squirrel; ears and nose never white. Greater part of the Mississippi Valley from northern Louisiana to southern Wisconsin.

White-bellied Fox Squirrel.— *Sciurus niger neglectus* (Gray). Belly white or whitish. Central Virginia and West Virginia to Pennsylvania.

Texas Fox Squirrel.— *Sciurus niger texianus* (Bachman). Smaller and paler than the Western Fox Squirrel. Coast region of Louisiana and Mississippi.

The Fox Squirrels are big strapping fellows, the largest members of their large family in America. They are also the laziest. They can defend themselves more easily from some of their enemies such as the hawks, and for this reason may have lost some of their agility.

They prefer also to lie abed of a morning, snuggling contentedly between their mossy or leafy coverlets, rather than hustle abroad with some of their noisier red cousins. This, however, is not because they fear the cold, but from sheer laziness. Dr. Hornaday says: "In captivity the northern Fox Squirrel seems to be more hardy in winter than the Gray Squirrel.



By permission of the New York Zoological Society

FOX SQUIRREL

This species is the largest of the North American Tree Squirrels. It is most common in the Southeastern part of our country. Photograph one-third life size

In the New York Zoological Park it blithely runs about in the snow when the latter takes pains to avoid it. Often the Fox Squirrel will be out when none of the other occupants of the rodents' cages are visible. It seems to me, however, that the Fox Squirrels are not as nimble on foot, or as active and daring in the treetops, as the Gray Squirrels."

Mr. Witmer Stone says of the southern species which is the more common type: "In rough weather they keep close at home in their hollow trees, choosing to go hungry rather than face the cold. In warm weather they gather wild fruit, berries and mushrooms and go into the corn fields as soon as the ears have reached the milky stage. Among the southern pines they make large nests of Spanish moss in the treetops, and here they bring the cones which they cut off, just as the Red Squirrels do the cones of the white pines in the North, biting off the scales in order to get at the seeds in a similar manner. The scales scattered about the foot of their tree often betray them to the Squirrel-hunter. They are much hunted as an article of food, being well flavored and heavy, but it requires skillful watching to kill many of them."

Photograph by Dr. R. W. Shufeldt

FOX SQUIRREL

The Fox Squirrels, which are found chiefly in the Southern States, are the largest members of the tribe in America

The Fox Squirrel's home is chiefly in the southeastern and gulf States. It is found as far west as Louisiana, and one species, the Yellow-bellied, along the Mississippi Valley as far north as Wisconsin. An observer in Colorado states that a few have been introduced there from the East, but thus far have not increased to any appreciable numbers.

TUFT-EARED SQUIRREL

Sciurus aberti *Woodhouse*

Other Name.— Abert's Squirrel.

General Description.— A large tree Squirrel about the size of the Eastern Gray and resembling it somewhat in color. Head blunt and rounded; ears tall and noticeably tufted, especially in winter; body large; tail less than half the total length, broad and bushy; feet of moderate length; pelage full and moderately soft. Only three subspecies are known.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{2-2}{1-1}$; Molars, $\frac{3-3}{3-3}=22$.

Pelage.— ADULTS: Sexes identical. *Summer.* Above plumbeous gray with broad dorsal area of reddish-brown; under surface, including tail, pure white; sides with a black line between gray of upper surface and white of underparts; tail black at tip, mixed gray and black above, white beneath; ears with conspicuous tufts. *Winter.* General coloration much as in summer but ears clothed with chestnut hair at base and tufted with blackish hairs more than an inch in length. YOUNG: Similar to adults.

Measurements.— Total length, 20.2 inches; tail vertebrae, 8.9 inches; hind foot, 2.5 inches; ear from crown, 1.5 inches; length of ear tufts in winter, 1.5 inches.

Range.— Pine-covered plateaus and mountains of northeastern Arizona eastward into New Mexico.

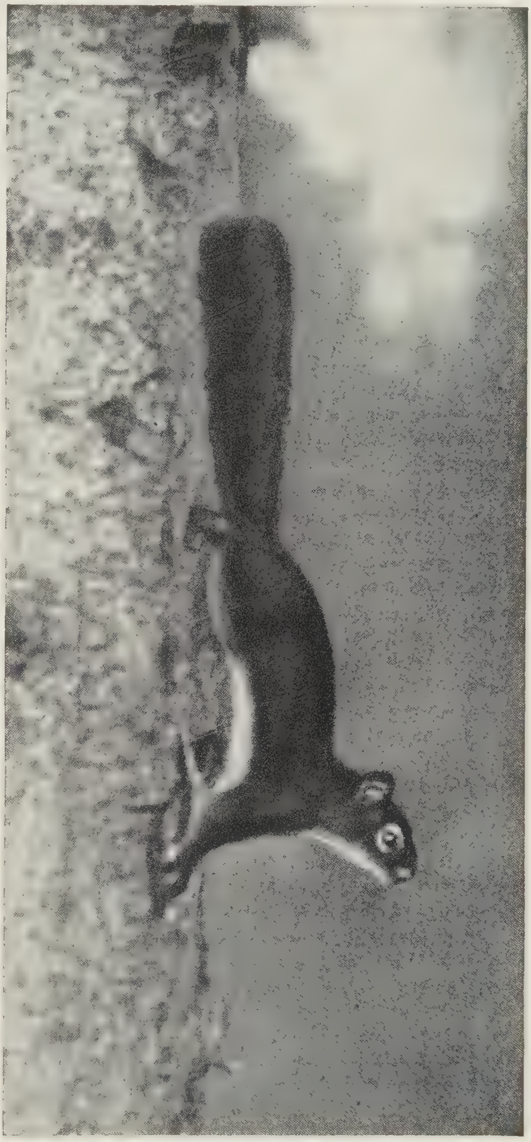
Food.— Pine nuts, acorns, ground nuts and green vegetation.

Although closely resembling the Eastern Gray Squirrel, in some respects, the Tuft-eared Squirrel deserves separate consideration, as in many ways it is nearer the typical Tree Squirrel of the Old World, *Sciurus vulgaris,* from which it differs only in color and in several minor characters. Its Old World relationships are indicated in the long ear-tufts found developed to such a degree in no other North American Squirrel. These ear-tufts are sufficient to distinguish this animal at once from the Eastern Gray.

The Tuft-eared Squirrel is characteristic of the stately yellow pine forests, and in the open vistas can be seen at a considerable distance. It is often first detected on the ground, moving about among pine cones which carpet the forest floor in many places. When alarmed, it lopes leisurely up to the base of a pine, usually the nest tree, which it seems reluctant to climb, barking and scolding at the intruder until approached somewhat closely. When thoroughly frightened it betakes itself to the higher branches and its claws make a very audible sound on the dry bark. When seated motionless on an exposed limb far up in a big pine, it presents an odd appearance, due to its long hairy eartufts. Once safely within the confines of the nest tree it will occasionally scamper part way down the trunk in a daring fashion, chattering excitedly. In climbing up or down a tree it spreads its feet far apart and by its flat appearance reminds one strongly of a Flying Squirrel.

The nest tree — usually a large dead pine with a hollow sufficiently large for the Squirrel's home — is generally located in the heaviest forest, and very few of the animals live in small timber or along the outskirts of the forest. A few nests, composed largely of dry pine needles, have been seen in the upper branches of large pines, but most of the Squirrels appear to be living in hollow trees. A stomach examined contained a mass of finely masticated green material which could not be identified with certainty, but probably consisted of the inner bark of the terminal branches of the yellow pine. One Squirrel was seen gnawing the bark from a good-sized limb, apparently feeding. The many freshly cut tips of branches beneath the pines in the neighborhood of the nest trees also attest to the Squirrels' activities.

In the silence of the vast forest reaches, the calls of this Squirrel are at times the only sounds which reach the ear. During rainy or inclement weather, however, the Squirrels are inactive and the calls rarely heard. The soft bark, sometimes sounding like " wuh, wuh, wuh," and again like " chuck, chuck, chuck," is usually repeated three or four times at short intervals, and each call is accompanied by a jerk of the tail. These Squirrels are occasionally kept in confinement and are said to make desirable pets.



RICHARDSON'S SQUIRREL

A handsome species of the West. This one was "snapped" running down a tree, near Old Faithful Inn, Yellowstone Park

EASTERN FLYING SQUIRREL

Sciuropterus volans (*Linnaeus*)

General Description.— A small, soft-haired arboreal Squirrel. Head blunt and rounded; ears low and broad; hair on ears very short; body small; tail about as long as head and body, broad and flat; an extension of skin from the sides of the body reaching from wrist to ankle forming when the legs are spread, a flat plane; legs of moderate length; hair very soft and of moderate length; eyes large and soft; general color above grayish-brown, below white; hairs on tail very soft, and while tail is broad it is not bushy. Nocturnal in habit.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{2-2}{1-1}$; Molars, $\frac{3-3}{3-3}=22$.

Pelage.— Adults: Sexes identical. *Summer.* Upper parts grayish-brown washed with rusty-brown, becoming deeper on upper surface of tail; upper portion of lateral membrane dark drab brown; below white, the hairs entirely white to the bases; under surface of tail tawny to tawny-white. *Winter.* Similar to summer, but upper parts tinged with grayish-brown. Young: Mouse-gray above.

Measurements.— Total length, 9.3 inches; tail vertebrae, 4 inches; hind foot, 1.22 inches.

Range.— Northern New York and southern New Hampshire south to Florida, west to the Plains.

Food.— Omnivorous to a considerable extent; nuts, seeds, insects, birds' eggs and occasionally young birds.

Related Species

Eastern Flying Squirrel.— *Sciuropterus volans volans* (Linnaeus). Typical animal as described above. Northern New York, southern New Hampshire to Florida, west to the Plains.

Florida Flying Squirrel.— *Sciuropterus volans querceti* Bangs. Underparts washed with rusty. Florida to southern Georgia, west to Louisiana.

Northern Flying Squirrel.— *Sciuropterus sabrinus sabrinus* (Shaw). Decidedly larger than Eastern Flying Squirrel; fur of underparts gray at base instead of all white. Boreal North America south to northern New York and southern New Hampshire.

Alpine Flying Squirrel.— *Sciuropterus alpinus alpinus* (Richardson). Larger than Northern Flying Squirrel with longer tail; above yellowish-brown. From MacKenzie River along east side of Rocky Mountains to northern border of the United States.

Cascade Flying Squirrel.— *Sciuropterus alpinus fuliginosus* Rhoads. Similar to Alpine Flying Squirrel in size, but color darker. Cascade coast and Sierra Nevada Mountains at high elevations.

Olympic Flying Squirrel.— *Sciuropterus alpinus olympicus* Elliot. Largest of the Flying Squirrels. Color dark. Total length 13.5 inches. Northwestern Washington in Olympic Mountains.

The Flying Squirrel is a very specialized animal and stands in a group well differentiated from the other North American Squirrels. Its so-called flying membrane at once marks it out from the other Squirrels, and in addition the texture of the pelage is very much softer, the individual hairs being rather long, very lax and exceedingly soft to the touch. The lateral membrane is supported mainly by the limbs, but in addition a cartilaginous spur or slender rod runs backward for a short distance from the wrist, and serves to stiffen the forward edge of this gliding plane. A number of Flying Squirrels have been described, some eighteen species and sub-species in all, and while the differences between many of these varieties appear slight, there are several well-marked groups best singled out on the basis of size difference.

The Flying Squirrel is a specialized member of his family, possessing a peculiar, hair-covered membrane of skin on each side of the body, between the fore and hind legs, and attached to both as far as the wrist and the ankle. When the Squirrel is about to "fly" it spreads its "wings," and from the summit of a tree springs into the air and then glides swiftly on an inclined air-plane, always in a slightly descending direction, until a movement, probably of both body and tail, inclines it upward, and it alights gently upon the object for which it set out. The tail, being thin and flat, with closely set silken hairs, probably serves a double purpose on these short "flights" — that of rudder and parachute. I do not mean by this that the tail can in any way turn the animal from a straight line, except that probably by bending it downward, and at the same time elevating the head, it brings the body in a convenient position for alighting upon an upright object. The distance that the Squirrel can "fly" depends entirely upon the elevation from which it starts. The angle of descent is ordinarily from twenty to thirty degrees, although the desire of the animal and the direction and force of the wind probably command an extreme range of from forty or fifty degrees to a nearly perpendicular drop. The powerful hind legs of the Flying Squirrel are important factors at the beginning of the "flight," for by means of these it is projected into the air with considerable force. The usual mode of travel from place to place, if trees are convenient, is sailing from the top of one to the base of another, then running up this and again sailing. It is surprising how quickly one of these little fellows can travel a quarter of a mile.

The Flying Squirrel is one of the most beautiful and graceful, and by far the most gentle of our Squirrels, becoming quite tame in a few days.

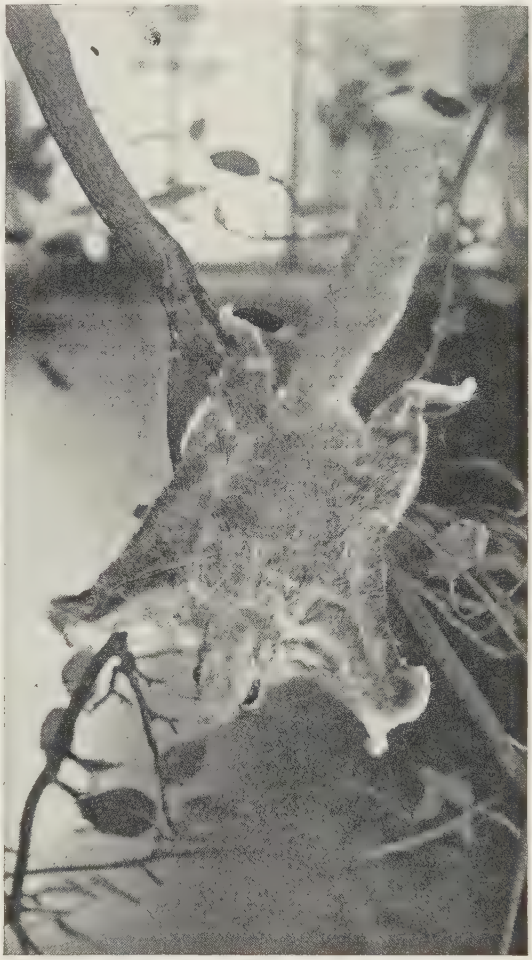
On one occasion a Flying Squirrel mother and four young ones were taken from a hollow tree. She seemed very willing to remain with them, and so the family was taken home in the pocket of a coat. They were placed in a box near a window, which was left partly open. At first the mother remained with the young only at night, but in a few days she had gained sufficient confidence to remain with them the whole day, and even allowed herself to be handled.

This was not an unusual instance of gentleness, for several years ago the writer knew a man to capture two adult Flying Squirrels, a male and a female, who took them home for pets. In a short time they were very tame, and at nightfall they would come from their cage and play about the house as contentedly as though they were in their forest home. In the spring comfortable quarters were made for the Squirrels in the woodhouse attic. At the rear of the attic stood a large maple tree, the boughs of which touched the woodhouse. The old tree had but one cavity, but it was supplemented by a woodpecker stub and fastened in an upright position about thirty feet from the ground. It did not take the Squirrels long to find an opening at the end of the attic by the old tree, and so their playground was considerably enlarged.

In the old stub the first litter was born, and as soon as the young ones were large enough to enjoy night frolics, the attic became their playhouse.

The distance from the old tree to the edge of the forest, where nuts were plentiful, was only a few rods, and even this was made easy for the Squirrels by the use of a fence and orchard. By the time the nuts were ripe the old instinct had conquered the few months of civilizing influences, and the whole family must have visited the forest nightly, judging by the quantity of nuts that were stored in boxes in the attic and in the stub of the old tree. The family lived together that winter, but the next spring most of the young ones sought homes of their own, probably in the forest near by. Other young were reared in the attic and the old tree, but the following August they all mysteriously disappeared, both old and young, probably obeying some migratory instinct. It is worthy of note that the autumn following their disappearance the nut crop was nearly a failure in that immediate vicinity. Could there be any connection between the two circumstances?

Concerning the degree of intelligence of the Flying Squirrel, we quote from Charles C. Abbott: "Years of familiar acquaintance with these Squirrels have not enabled me to detect much in their habits indicative of intelligence; and it is for this principally that I look in studying animal life. I feel sorry to have so poor an account to give of these beautiful creatures, but I am compelled to say it of them — they are not 'smart.' Notwithstanding all their vivacity when in their native haunts, and their eminently gregarious habits, they do not suggest by any of



Photograph from the American Museum of Natural History

FLYING SQUIRREL

This specimen was mounted, but the attitude in taking its flying leap is very lifelike

their movements, so far as I could ever detect, any decided indication of that sociability characteristic of the Ground Squirrels, or Chipmunks. Each, on the contrary, jumps, runs, flies, solely on his own account, associated together indeed, but never acting in concert. Their several squeaky cries, too, are quite as frequent when they are alone as when associated with their fellows."

If one really wishes to know the Flying Squirrel, the best plan is to go into a large grove of maples, beeches, and chestnuts on a still moonlight evening in early autumn, find a comfortable seat and remain quiet. If it so happens that one does not see a Flying Squirrel, one will be amply repaid, for other night-loving animals are abroad, and they are as interesting as those seen by day. One must be patient, look, and listen! The night hawk is already on the wing, and the bat has taken the place of the chimney swift. Then comes a sound like that of a nut dropping from a tree. A slight rustle among the leaves is heard overhead, as a shadowy form glides through the air, and alights upon the bole of a tree; another soon follows and alights at nearly the same place and hastens after the first. It is quite common for three of four Flying Squirrels to start from the same or neighboring trees, and at times there will be various lines of them crossing and recrossing one another.

The writer cannot quite agree with Mr. Abbott concerning the play of the Flying Squirrels. As far as I can judge, frolic and amusement occupy the greater part of the waking hours, and old and young seem to enjoy it alike. Even during the "business hours," when the storehouses must be filled with nuts for winter use, the same rollicking spirit holds sway over this Squirrel band.

The Flying Squirrels, unlike most others, live in communities, but during the winter a dozen or even more may occupy the same cavity in a hollow tree. Even in the storing of food for winter, several may unite in gathering a general supply. The storehouse may be in the same cavity as the living quarters, or in a separate one in the same tree, while it is occasionally in a tree some little distance away. The food stored consists of nuts and seeds of various kinds; but in season, buds and fruits are much enjoyed.

Wood-choppers very often find the storehouses of the Flying Squirrels. One man took six quarts of beechnuts from a cavity in a large maple tree in the month of January, and from the same tree counted eight escaping Flying Squirrels. In this instance the Squirrels and nuts were found in separate cavities.

Flying Squirrels make large nests of leaves in tall trees, which are similar to those of the Gray Squirrel. These nests are sufficiently compact to withstand the storms of winter, and warm enough to protect the Squirrels during cold weather. I have never known these nests to contain food for winter use. It may be that they are used principally as summer homes.

The Flying Squirrel during the day avoids the light, its large eyes, like those of the owl, being better adapted to darkness, and so one may get the idea that it is a dull and uninteresting pet, crawling into your sleeve or pocket and seeking any dark place of concealment. When asleep it is so rolled up as to appear like a ball of fur, the head resting near the base of the tail, which is spread over the body, doing duty as pillow and coverlet.

S. A. Lottridge.

GREAT PLAINS GROUND SQUIRREL

Citellus elegans (*Kennicott*)

Other Names.— Great Plains Spermophile, Wyoming Spermophile.

General Description.— The Great Plains Ground Squirrel may be taken as characteristic of a very large group of Ground Squirrels found all over western North America. It is of rather small size. Head blunt; ears broad, rounded, of moderate height; white eye ring; tail fairly bushy, nearly half length of head and body; body elongate but not slender; legs short; general color brown above; below dull yellowish-white.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{2-2}{1-1}$; Molars, $\frac{3-3}{3-3}=22$.

Pelage.— Adults: Sexes identical, seasonal variation not conspicuous. Upper parts brown, mottled indistinctly, black tips to hairs; top of head like back but without black tips to hairs; sides, flanks and upper surface of feet pale fulvous; under parts a paler shade of fulvous; chin whitish; whitish buff ring about eye; tail above, mixed brown and black, tip black edged with whitish, tail below, brown or fulvous with black tip. YOUNG: Colors paler.

Measurements.— Total length, 10.8 inches; tail vertebrae, 3 inches; hind foot, 1.7 inches.

Range.— Wyoming, Colorado and Utah in the Plains region and up into foot hills.

Food.— Grasses, seeds, grain and some insect food.

RELATED SPECIES

Great Plains Ground Squirrel.— *Citellus elegans* (Kennicott). The typical animal of the above description. Wyoming, Colorado and Utah.

Richardson's Ground Squirrel.— *Citellus richardsonii* (Sabine). About the same size as the Great Plains Ground Squirrel, coloration yellower. From Saskatchewan, latitude 55° N. south to South Dakota and Montana.

Townsend's Ground Squirrel.— *Citellus townsendii* (Bachman). Small; tail short, not very bushy; colors dark. Nebraska westward to plains of Columbia river, and from Wyoming and Utah to Montana, Idaho and Oregon.

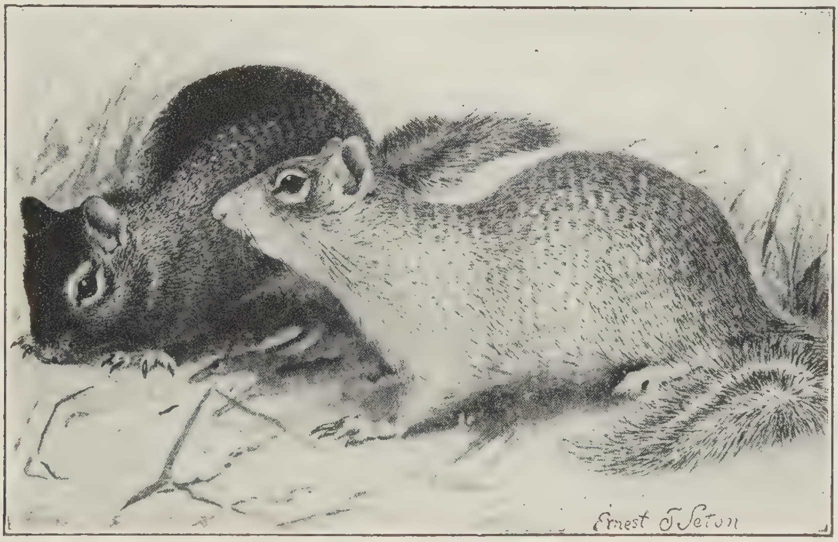
Soft-haired Spermophile.— *Citellus mollis mollis* (Kennicott). Size very small; ears small; silvery gray above; fur very soft. Utah and Nevada.

Picket-pin " Gopher "—*Citellus armatus* (Kennicott) Body stout; ears large; tail short and moderately bushy; pelage soft; color above dark gray and black; length 10 inches. Utah, Wyoming, Idaho and Montana.

Spotted Spermophile.— *Citellus spilosoma spilosoma* (Bennett). Size small; form slender; length 10 inches; tail about 2.25 inches; above, rusty brownish spotted with ill-defined white spots. Southern California to New Mexico and Texas.

Round-tailed Spermophile.— *Citellus tereticaudus* (Baird). Size small; tail not bushy, and about four-fifths length of head and body; grizzled grayish-brown above; beneath brownish-white; length 10 inches. Central California to southern Arizona.

Franklin's Spermophile.— *Citellus franklinii* (Sabine). Similar in build to Thirteen-striped Ground Squirrel, but lacking the stripes; color grayish-brown. From Saskatchewan south to Nebraska, Kansas and Missouri, eastward to Indiana.



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GROUND SQUIRRELS

Points of difference between the Douglas and the California Spermophiles are shown in the above drawing by E. T. Seton

Spermophile is a word literally meaning " seed lover," and has been given to a large group of Burrowing or Ground Squirrels, as it most nearly describes their chief characteristic. They are indeed seed-lovers, as the farmers in the West know to their sorrow; for this small animal causes the annual loss of large crops through destruction of the seed grain.

The Spermophile is a Ground Squirrel which in some of its species resembles the tree Squirrel, on the one side, and the Chipmunk on the other. Its burrowing traits ally it to the Marmot. It is frequently called a " Gopher " in the Middle West, but this is a misnomer. The only true Gophers in America are the Pocket Gophers, described elsewhere.

Ground Squirrels are found in the greatest numbers on the great plains of the West. Because of the scarcity of trees they have doubtless lost their tree-climbing propensities, and they prefer to dig deep tunnels underground, in which they fix up very cosy quarters. They always seek and prefer the open country.

Crevices in rocks, and burrows similar to those of Chipmunks, but larger, serve as homes for the Ground Squirrels of the plains. Sometimes the mound at the mouth of the burrow is several inches high, but frequently it has been so beaten down that there is scarcely any elevation at all, but just a bare spot of earth a yard in diameter. Often the mouth of a tunnel is under a root, the base of a tree, or the lower edge of a boulder, and little or no dirt is scattered about to indicate its presence. Always, however, the surrounding area for three feet or more is kept bare, smooth and hard by the constant trampling of little feet.

These Spermophiles spend hours at a time sitting or lying near the mouth of the burrow, and rarely stray farther away than one hundred yards. As a class, they are gregarious animals, but the Picket-pin " Gopher " is much less so than many of the others. Their burrows may be scattered along a road for miles, all of them several rods apart. In wide areas of open grassy country, small colonies may be established. In Wyoming, and in Colorado, the writer has seen a few groups of ten or a dozen homes each. Not more than half an acre was occupied in any case. About camp sites they are particularly numerous. These little animals make an interesting group to watch, after a hard day in the saddle, as they scurry about in search of waste grain and camp refuse. The writer has never seen a Spermophile in a dense forest or at a greater altitude than 8500 or 9000 feet. In northern Wyoming their lowest altitude seems to be about 5000 feet.

Like the Chipmunks, the Spermophile's food is largely vegetable matter made up of seeds and grasses, but it will not scorn animal food such as grasshoppers and other insects. In former days dead Bison were said to be favored as food. They will attack growing grain, and store the ripened grain in their underground chambers.

From early fall until early or late spring, according to the latitude, the Spermophile is dead to the world, but, be the ground bare or snow-covered, it appears at about the same time in the spring in any given locality.

As soon as hibernation is over the raising of a family occupies its attention. Four to six young to a litter appear in middle or late May in Colorado.

Small rodents seem to exist to furnish food for the birds of prey and carnivorous animals large and small. To the Bear, the Coyote and the Weasel, they are all acceptable, and the Ground Squirrel is no exception to the rule.

Mr. Merritt Cary, in " A Biological Survey of Colorado," says: " The sage flats in Middle and North parks are densely populated with these Ground Squirrels, and ranchmen consider them very injurious to the cattle range and to small grain. Judging from my own observations the damage inflicted is by no means slight, and when the large territory inhabited by them is considered, it must be very considerable. During July I often saw numbers in the rye fields eating the green stalks, and not a vestige of grass remained near their burrows. Ranchmen in the Snake River Valley claim that this species destroys fully a third of the rye crop, pulling down the stalks to get at the heads. In North Park I often saw them in the hay meadows, whither they resort in the early morning, busily engaged in pulling down and eating the tall grass stems. This species hibernates very early in the autumn."

Close acquaintance with the *Picket-pin " Gopher "* in the western plains shows how well it deserves its name. Curiosity seems to require that it sees as much as possible of every strange object. At first it stands up in a bent position like a Tree Squirrel, then straightens up, and finally fairly raises itself on its hind legs, stretches to its full height, and gazes with all its might with its twinkling, bright black eyes. When in this position, with its arms partly folded at its sides, the diameter of its body seems to be about the same throughout, and the term " Picket-pin " is the most apt that could be applied, especially in a region where horses are often tethered. A close or a sudden approach will send the animal scurrying to its burrow with a sharp, trilling whistling resembling that of a Chipmunk. In a moment, if you look down into the hole, you will see its head appear in the blackness. Stand still, and the little fellow will soon move out with short starts and jerks. If you move backwards a few yards, it will presently be looking at you in the regular picket-pin style. Attracted by curiosity perhaps two or three more from the same opening will join the first.

Richardson's Spermophile is a northern neighbor of the Great Plains species. It is about the same size, but of more yellowish hue, so that it is hard to distinguish from the surface of the ground, especially in autumn. It is found as far north as Saskatchewan, and is reported to be far more destructive to the grain fields than its southern relative. This species has a short, thin body, squat legs, and a short thin tail. It looks very much like an underfed Prairie Dog.

The *Spotted Spermophile* is a little Ground Squirrel which prefers the deserts or the dry levels of the plains and the eastern border of the Rocky Mountain region. In the desert the mouths of its burrows often open under yuccas. Shy, quiet, small and prettily marked, these animals are in strong contrast to the big, noisy plain-colored species, such as the Bushy-tailed Spermophile. Under favorable conditions they increase almost as rapidly as rabbits. There may be as many as eight young to a litter.

Franklin's Spermophile is one of the more common varieties. It is found in the middle West, from Indiana to Missouri and Nebraska, and extending north into Canada. This animal has very similar habits to Richardson's Spermophile, and like it is interesting in being a connecting link. But while the latter seems nearest related to the Marmots, Franklin's Spermophile strongly resembles the Tree Squirrel. In many localities it called the "Gray Ground Squirrel."

When they become numerous near farms they are troublesome, venturing boldly into the barns and granaries; but the harm they do is offset to some extent by the insects they devour.

Photograph by J. M. Johnson, copyright by Outing

"PICKET-PIN GOPHER"

A name bestowed upon this gray Spermophile, in the Middle West, from the fact that a row of them will stand so erect and still as easily to be mistaken for picket-pins

In the Department of Agriculture, twenty-nine stomachs were examined with the following result: Animal matter present, 30.3 per cent.; vegetable, 68.5 per cent.; and undetermined, 1.2 per cent. Out of the whole twenty-nine stomachs examined, twenty-six contained the remains of insects. Thus the grain consumed by this animal is at least partially paid for by the destruction of insects that prey upon crops; but farmers everywhere are diligent in destroying it with poisoned wheat placed in its burrow.

J. M. Johnson.

COLUMBIA GROUND SQUIRREL

Citellus columbianus (*Ord*)

General Description.— A large, heavy-bodied, short-tailed Ground Squirrel. Head very blunt; ears broad, rounded, of moderate height; body very thick-set; tail only about one-quarter length of head and body, flat and moderately bushy; legs short; color above, mixed white, black and yellowish-brown; below, brownish-red; hairs of moderate length and coarseness.

Dental Formula.— Same as foregoing.

Pelage.— Adults: Sexes identical; some seasonal variation but not especially conspicuous. Color above, mixed white, black and yellowish-brown with numerous blotches formed by the white; an obscure brownish streak on back; upper part of neck blackish; side of face grizzled black and white; under parts and hind parts of hips and thighs brownish-red; feet like under parts; tail above gray, brown and black mingled; beneath, brownish-red bordered with black. Young: Like adults but colors paler.

Measurements.— Total length, 15 inches; tail vertebrae, 3.5 inches; hind foot, 1.8 inches.

Range.— From western Montana to Washington, and north through British Columbia and Alaska to Plover Bay in Siberia.

Food.— A variety of fleshy plants, seeds and roots.

Remarks.— This Ground Squirrel is an example of the group of heavy-bodied, short-tailed Ground Squirrels that range throughout the Northwest. They are all large animals. Some thirteen of the larger species have been described, if for convenience sake we form a group, although they are closely related to the smaller Ground Squirrels of a more southern range.

Related Species

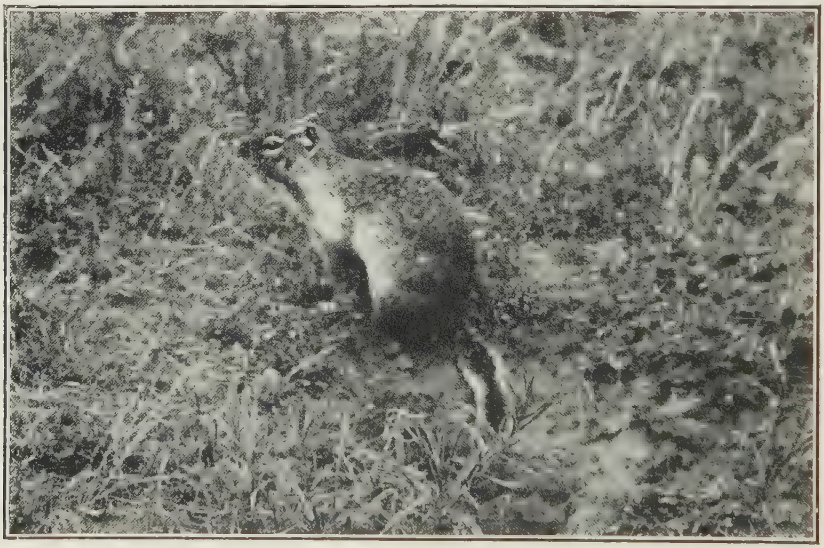
Columbia Ground Squirrel.— *Citellus columbianus columbianus* (Ord). Typical animal of the above description. From Montana north to Alaska.

Point Barrow Ground Squirrel.— *Citellus barrowensis* (Merriam). Largest Ground Squirrel known. Region about Point Barrow, Alaska.

Alaska Ground Squirrel.— *Citellus beringensis* (Merriam). General color fulvous; ferruginous on nose and underside of tail; back spotted with buffy white; size large. Common to the region about Cape Lisbourne, Alaska.

Yukon Ground Squirrel.— *Citellus osgoodi* (Merriam). Size large; tail long; gray above with fulvous flanks; back fulvous spotted with whitish; under parts ferruginous. Yukon region, Alaska.

Arctic Ground Squirrel.— *Citellus parryii* (Richardson). One of the largest and hardiest; tail short. Mixed black, white and yellowish-brown above, top of head cinnamon and black. Arctic America from Melville Peninsula to southwest Yukon River, and in the east to 65° north latitude.



Photograph by the U. S. Biological Survey

COLUMBIA GROUND SQUIRREL

A very large Spermophile that is fond of roots and tubers, and hibernates for long periods

The group of Ground Squirrels typified by the Columbian is found in the extreme Northwest, reaching through British Columbia up to and across Alaska, and as far west as Siberia. The animal resembles its southern cousins in many respects, except that it is about half as large again as the usual type. It is the size of a large cat, with heavy body, short tail, and thick fur.

On account of its bleak environment, some change also is noted in its habits. It greedily eats roots and tubers and usually prefers a snug hole in the rocks to digging very far down in the hard soil. The animal is sluggish in its actions, and falls an easy prey to its enemies including man. This is, in fact, one of the few Spermophiles that men eat. Its flesh is said to be well-flavored.

From four to six months in the year it hibernates, this long period being necessary on account of the length of winter. One animal was examined during this sleep, and it was found that the heart action was reduced to four faint beats per minute, the temperature was only fifty-eight degrees, and there was no visible breathing. The circulation of the blood was so feeble that when a limb was amputated, only a few drops of blood slowly oozed from the wound while the nerves showed no sensitiveness. In fact, the animal was in a condition of suspended animation, as if under the influence of chloroform.

BUSHY-TAILED GROUND SQUIRREL

Citellus grammurus (*Say*)

Other Names.— Rock Squirrel, Gray Digger, Scrub Gopher, Spermophile.

General Description.— A large, long-tailed, full-bodied Ground Squirrel. Head blunt; ears of moderate height; body not excessively heavy; tail very long, nearly half of total length and quite bushy, flat; legs of moderate length; soles of feet smooth; general coloration drab or sepia, thickly sprinkled with small whitish spots; hairs fairly long and coarse.

Dental Formula.— Same as foregoing.

Pelage.— ADULTS: Sexes identical, seasonal variation not conspicuous. Back and sides thickly sprinkled with indistinct, small, whitish or pale brown spots of sepia on drab ground color. Color below, brownish-white or grayish; tail grizzled brown with hairs annulated, under surface grayer than upper surface. YOUNG: Paler in color with distinct white neck patches; spotting dimmer than on adults.

Measurements.— Length, 20 inches; tail vertebrae, 8.5 inches; hind foot, 2.2 inches.

Range.— Park region of the Rockies from Central Colorado south to Mexico.

Food.— A number of plants and their seeds and probably some insect food.

RELATED SPECIES

Bushy-tailed Ground Squirrel.— *Citellus grammurus grammurus* (Say). The typical animal of the above description. From Central Colorado south to Mexico in park region of the Rockies.

California Ground Squirrel.— *Citellus grammurus beecheyi* (Richardson). Smaller than the typical form with body more slender and tail shorter. West of the Sierra Nevada in California.

Texas Rock Squirrel.— *Citellus grammurus buckleyi* (Slack). Like the Bushy-tailed Ground Squirrel in size and form, but with anterior half of the dorsal surface black and hairs elsewhere much blacker. Middle Texas to western Texas.

Douglas's Bushy-tailed Ground Squirrel.— *Citellus grammurus douglasii* (Richardson). Size intermediate; shoulder patches black. Northern California and Oregon.

Fisher's Bushy-tailed Ground Squirrel.— *Citellus grammurus fisheri* (Merriam). Similar to the Bushy-tailed Ground Squirrel, but sides of neck and shoulder stripes heavier white. Western border of Nevada, central and southern California.

The group of Ground Squirrels which the Bushy-tailed Ground Squirrel typifies, resembles, perhaps more closely than any others of the family, the large Gray Squirrels of the trees. The Bushy-tailed has the largest and bushiest tail of all the Ground Squirrels and its general appearance is very similar to that of the true Gray Squirrels, *Sciurus,* but it may be distinguished from the latter by its mottled appearance and the fact that it sticks pretty closely to mother earth. Seven subspecies of this form are recognized north of the Rio Grande, all very similar in most characteristics.

The Bushy-tailed Ground Squirrel or "Scrub Gopher," as it is sometimes called, differs only slightly in habits from the Striped Spermophile, and the Picket-pin Gopher. It prefers a more wooded country than the former, and a less elevated region than the latter. It likes a brushy, rough territory, with a few trees here and there. In fact, this animal seems to occupy the same position in the Rocky Mountains that the Picket-pin Gopher does in the prairie country.

Photograph by W. P. Dando

HARRIS ANTELOPE GROUND SQUIRREL

An inhabitant of the southwest

The burrow is similar to that of the Striped Spermophile, but is likely to be dug into the side of a brush-covered bank, and it is farther below the surface.

After hibernating, this animal appears later in the spring than other species of the same region. About May first is the time it is first to be seen. Mating soon begins, and the four to seven young are born about a month later.

Although not so fiercely carnivorous as the striped form, the Bushy-tailed Spermophile will eat flesh whenever it can find it. Vegetable matter, however, furnishes its main food supply. Unlike some other species, it requires a supply of water to drink. Some Ground Squirrels live in arid wastes and seem to get enough moisture from their food.

In early October, the "Scrub-Gopher" makes itself safe against unfavorable weather and enemies by plugging up the various entrances to its home with earth, and enters into its night of six months.

Merritt Cary, who recently made an extended study of these animals in the West, says: "Rock Squirrels nearly always live in rocky mountains, the ledged and boulder-strewn sides of canyons, the bare rocky slopes along the base of the foothills, and the rim rock of outlying mesas and buttes being especially frequented. In the pinyon country their burrows are often found along the margins of fields in a nearly level country. As a rule, however, the burrows are located beneath boulders at the base of a rocky canyon rim or in rock slides. Rock Squirrels are quite shy and wary, and when one is surprised in the bottom of a canyon, as is often the case, it invariably runs up the slope and takes refuge among the rocks above. If the observer remains perfectly quiet, he may at length detect the animal peering silently over the top of a large boulder, but it generally vanishes at the slightest noise or motion. I watched one of these Squirrels dusting itself near Bayfield. Apparently it was unaware of my presence and at intervals would run to a dusty spot in a path, throw the dust up with its fore feet, turn on its back, and wriggle and squirm along the ground in the greatest enjoyment. This performance was repeated a number of times when suddenly the little fellow spied me and raced off through the brush.

"While at Ashbaugh's ranch in June, I often heard the sharp alarm notes of Rock Squirrels in the orchard back of the house. Near Coventry in July they were feeding extensively upon pinyon nuts. In Grand Valley, near Glenwood Springs, in October, numbers were seen in the tops of large pinyons busily feasting upon the nuts, and so common is this habit in that section that the animals are locally known as gray tree Squirrels.

"The food of Rock Squirrels consists of pinyon nuts, acorns, and juniper berries, and consequently over much of their range the animals do little damage. In some sections, however, they are reputed to show a fondness for young chickens. They destroy many apricots on the trees for the sake of the seeds, of which they are especially fond; they eat holes in canteloupes and watermelons on the vines in search of the seeds, which they carry into the rocks to be eaten at leisure; and they also dig up and eat much newly planted corn."

THIRTEEN-STRIPED GROUND SQUIRREL

Citellus tridecemlineatus (*Mitchill*)

Other Names.— Striped Gopher, Striped Prairie Squirrel, Spermophile.

General Description.— A small animal with body rather slender for a Ground Squirrel but more robust proportionally than the Chipmunk. Head rounded; ears low, rounded, inconspicuous; tail somewhat bushy but flat, and about one-half length of head and body; legs short; fur short and rather glossy, the hairs being somewhat hard and shining; color pattern unique, consisting of 13 stripes along the back; underparts pale tawny brown; eyes black.

Dental Formula.— Same as foregoing.

Pelage.— ADULTS: Sexes identical and no seasonal variation in the color pattern. Above, back lined with 13 longitudinal stripes from ears to tail as follows: 7 long stripes of dull yellowish-white, alternating with 6 more or less broken rows of spots similar in color to stripes; stripes broken up on crown and haunches; rest of upper parts dark brown; belly dull buffy or tawny, nearly white on chin; tail yellowish-brown or sienna, fringed with black hairs yellowish tipped. YOUNG: Striped like adults but color paler.

Measurements.— Total length, 11 inches; tail vertebrae, 3.5 inches; hind foot, 1.4 inches.

Range.— Central North America from eastern Michigan to Montana, Colorado, central Texas, north to Saskatchewan Plains, and in prairie region of Mississippi from Ohio to Minnesota.

Food.— Seeds, grasses and also flesh.

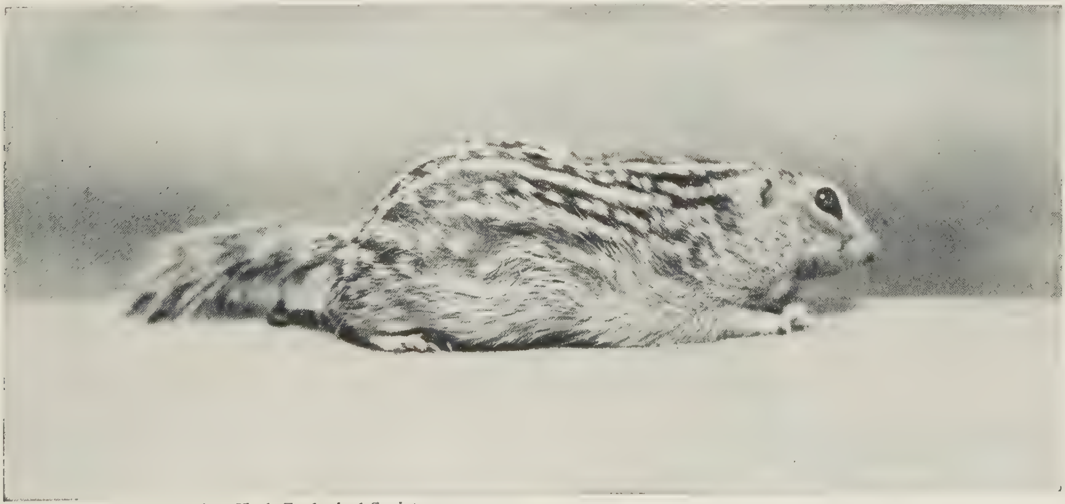
RELATED SPECIES

Thirteen-striped Ground Squirrel.— *Citellus tridecemlineatus tridecemlineatus* (Mitchill). The typical animal of the above description. Central North America in the Prairie region.

Pallid Thirteen-striped Ground Squirrel.— *Citellus tridecemlineatus pallidus* (Allen). Size small, colors paler, light stripes white and wide. Wyoming, south to Texas and east to Missouri on the plains and desert regions.

Little Thirteen-striped Ground Squirrel.— *Citellus tridecemlineatus parvus* (Allen). Smaller than the typical form. Utah and Wyoming.

This small Ground Squirrel, because of the peculiar striping on the back, is at once distinguishable from any of the other Spermophiles. It is a prairie animal living on the grassy plains and not found in the heavily wooded regions. There are seven subspecies of the Thirteen-striped Ground Squirrel, all having the same essential pattern on the back and differing only in cranial characters or intensity of color. Vernon Bailey in his report upon these animals says: "Throughout the prairies of the Mississippi Valley the Striped Spermophile is a familiar object as it darts through the grass to its hole or is seen standing upright on its hind feet, straight and motionless as a stick. With its short ears, smoothly rounded head, and the fore feet drooping at its sides, there is no point about its outline to catch the eye, and at a little distance it is



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THIRTEEN-STRIPED SPERMOPHILE

This peculiarly marked Ground Squirrel is a Plains type, and is not found in heavily wooded sections impossible to distinguish it from an old picket-pin or fence stake. Standing thus the animal will often allow one to approach within a few yards, then quickly dropping on all fours it utters a shrill chatter and dives into a hole close by. Remain quiet for a few minutes and its head reappears at the entrance of the hole, and the little black eyes peer at you curiously. Walk away from the place and it will soon come out and, standing up again, watch you as long as you are within sight, uttering an occasional note of alarm or warning to its friends."

Usually the Striped Spermophile is confined to the sagebush plains and the prairies, although it occasionally works up into altitudes of 9000 feet. This is also a form which shuns woodland of any greater density than that of a natural park. In the prairies of southern Canada, and of the Mississippi basin it is common although outnumbered by some other kinds, especially by the yellow or Richardson's Ground Squirrel. The settlement of these regions seems to be causing the decrease of the striped but not of the yellow species. One authority states that the very shallow burrows and chambers of the former are destroyed by plowing, and that the deeper ones of the latter are only temporarily plugged up. Since the burrows of the Striped Spermophile are only about six inches below the surface, plowing would not only destroy them, but the young as well.

The nesting burrow is complicated by many twistings, turnings and branchings. There are also several openings, some of which are occasionally stopped up. The real home room is about nine inches in diameter by six inches in height. In addition to this type of burrow, there is a simpler one, which may be used for temporary retreat from danger. To render the tunnel entrance inconspicuous, the excavated dirt is often scattered, and the opening hidden by a bunch of grass, weeds and other objects.

The Thirteen-striped Spermophile is apparently the most carnivorous of all this family. As much as 46 per cent. of its stomach contents has been found to be insects, caterpillars, grasshoppers, cocoons, insect eggs, birds, reptiles and mice. Offal of any kind of flesh is eagerly seized upon. Lacking other meat, it will eat its own relatives. For vegetable food, it uses the same materials as others, grain and seeds being the favorites. Food which will spoil is never stored. Extra food is laid by in side chambers made for the purpose. Since the animal is asleep all winter, this food must be used in the early spring when other food is scarce. This is just the time, too, when much food is needed. Because of their long fast the animals are thin, and the mating activities begin at once when they awaken.

In late May or early June, the young are born. The number varies from seven to fourteen, with nine the average. They are among the most helpless of young Ground Squirrels. Their eyes do not open at once, and twenty days are required for hair to appear on their naked bodies. By the end of summer, however, they are full grown.

The enemies of this species are the same as those of other Spermophiles. In many of the western States the larger hawks are protected by law, partly because of their fondness for Spermophiles and Prairie Dogs. Three and even five western red-tailed hawks may often be seen circling over colonies of these animals waiting for a favorable opportunity to swoop down upon one.

It is true that most Ground Squirrels take considerable grain, and may pull up newly planted seeds, but in the case of this species, the number of harmful insects and mice destroyed more than compensates for the damage done to the growing crops.

ANTELOPE GROUND SQUIRREL

Ammospermophilus leucurus (*Merriam*)

Other Name.— White-tailed Spermophile.

General Description.— Size small; head blunt and rounded; ears rounded and low; body moderately thickset; tail short, fairly bushy and flat, about one-third length of head and body, carried turned up over animal's back when running; hair moderately short; color above, grizzly gray with white stripe on either side of back; underparts glistening white.

Dental Formula.— Same as foregoing.

Pelage.— ADULTS: Sexes identical, seasonal variation not conspicuous. General color above, grizzled gray; vinaceous on head and rump with broad white stripe on either side of back; outside of legs salmon color; underparts glistening white; tail above, iron gray with indistinct white border, beneath, white bordered with black. Young: Much as adults but colors not so strong.

Measurements.— Total length, 8.5 inches; tail vertebrae, 2.8 inches; hind foot, 1.5 inches.

Range.— California and Utah to Arizona and New Mexico in arid regions.

Food.— A variety of different plants and their seeds.

Remarks.— The Antelope Ground Squirrel is representative of a group of 9 species and subspecies found north of the Rio Grande, all conforming rather closely to the same general type.

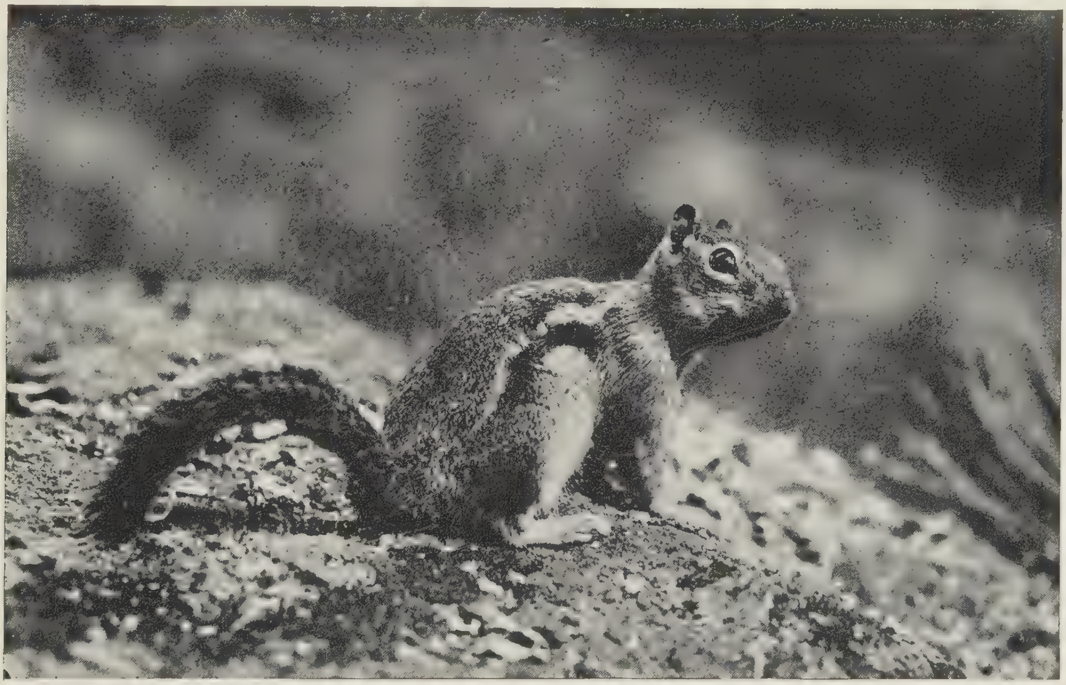
Related Species

Antelope Ground Squirrel.— *Ammospermophilus leucurus leucurus* (Merriam). Typical animal as described above. California to New Mexico.

Cinnamon-Colored Antelope Ground Squirrel.— *Ammospermophilus leucurus cinnamomeus* (Merriam). Ears, tail and hind feet larger than in the Antelope Ground Squirrel, with color above pale cinnamon. Desert region of Colorado, Utah and Arizona.

Harris's Antelope Ground Squirrel.— *Ammospermophilus harrisii harrisii* (Audubon and Bachman). White stripe on sides narrow; color above, grizzled grayish-brown, and, in general, stronger coloration than the Antelope Ground Squirrel; tail lacking black dorsal stripe and not so white below. Southern Utah and Nevada into California, Arizona and northwest New Mexico.

Texas Antelope Ground Squirrel.— *Ammospermophilus interpres* (Merriam). As large as *leucurus*, but tail tinged with fulvous, and head grayer; pelage much finer and longer. Eastern desert tract of New Mexico and Texas.



Photograph by A. E. Butler Courtesy of the American Museum of Natural History

SAY'S GROUND SQUIRREL

The Ground Squirrel may be readily distinguished from the smaller Chipmunk, by the fewer number of stripes on the former

The Antelope Ground Squirrel gets its name from the fact that the tail, with its glistening white under surface, is turned up over the back when the animal runs, and by this one feature it may be known from all the other Ground Squirrels. In addition it can be easily distinguished by a gray upper body contrasting with the pure white of the under parts. It is smaller than most of the Spermophiles, seldom exceeding five or six inches in body length.

Antelope Squirrels frequent sandy arroyos, and are striking objects as they frisk about in the morning sunshine with the pure white under surface of the upraised tail showing prominently. They are easily alarmed and retreat precipitately to the burrows, which are usually in the sandy bank of a dry desert wash or beneath sage or Atriplex bushes. In a few moments the animal may be watching the intruder from the mouth of a burrow or from behind a pile of rocks, but it disappears at the slightest noise or movement. One which J. Alden Loring heard had a note described as "loud, shrill, and rattling, and gradually dying out like a policeman's whistle."

Mr. Loring states that the Antelope Squirrel has from four to six young in a litter. Ranchmen say that Antelope Squirrels do much damage in the spring by digging up newly planted corn. They appear to be particularly voracious and active at this season.

SAY'S GROUND SQUIRREL

Callospermophilus lateralis (*Say*)

Other Names.— Big Chipmunk, Spermophile.

General Description.— A small Ground Squirrel about twice the size of the Eastern Chipmunk and somewhat like it in appearance. Head rounded; ears of moderate size, broad and rounded, closely haired; body inclined to be thick set; tail about half the length of head and body, with long hairs arranged laterally to give a broad, flat appearance; legs in proportion to body; color in general, grizzled grayish-brown above, below brownish-gray.

Dental Formula.— Same as foregoing.

Pelage.— ADULTS: Sexes alike, seasonal variation from typical summer pelage as described below to grayer and more rusty in winter. Back, from shoulders to tail, a mixture of black, grayish-white and rufous; contrasting stripes formed by two black stripes inclosing a white stripe, along each side of back; flanks and sides of neck deep bright chestnut; top of head chestnut; upper surfaces of feet pale yellowish rusty color; a light ring about eye; below, light rufous with black bases to the hair; tail above, mixed black and chestnut with chestnut border, below, chestnut with poorly defined black border, the hairs tipped finely with chestnut again. Hair everywhere of short to moderate length and rather coarse than soft. YOUNG: Pattern as in adults, but colors not so strong and contrasting.

Measurements.— Sexes identical in size. Total length, 11 inches; tail vertebrae, 3.5 inches; hind foot, 1.65 inches.

Range.— Mountainous parts of Colorado, New Mexico and Arizona.

Food.— A great variety of seeds and various types of vegetation.

RELATED SPECIES

Say's Ground Squirrel.— *Callospermophilus lateralis lateralis* (Say). Typical animal as described above. Rocky Mountains in Colorado, New Mexico and Arizona.

Washington Yellow-headed Ground Squirrel.— *Callospermophilus lateralis saturatus* (Rhoads). Size large; tail very long; colors dark. Central Washington.

Yellow-headed Ground Squirrel.— *Callospermophilus cinerascens* (Merriam). General color grizzled ash-gray. Montana, Idaho northward into Alberta.

Golden-headed Ground Squirrel.— *Callospermophilus chrysodeirus chrysodeirus* (Merriam). Head and neck bright ochraceous; inner stripe as large as outer. Oregon, northern California and western Nevada.

Chestnut-tailed Ground Squirrel.— *Callospermophilus castanurus* (Merriam). Inner black stripe as large as outer; mantle chestnut; tail deep chestnut below, yellow above. Found in the Wasatch Mountains, Utah.

Say's Ground Squirrel is typical of a well circumscribed group showing relationship, on the one hand, to the small Chipmunks and, on the other, to the large Spermophiles or true Ground Squirrels. Say's Ground Squirrel and its related forms may be readily distinguished from the smaller Chipmunks by the reduced number of stripes, there being never more than two light stripes as against three or more on the Chipmunks. This group is of western distribution and contains some ten species and subspecies north of the Rio Grande. The range of variation is not very great in size, but in coloration runs from forms having a very strikingly contrasted pattern to others with the tones more subdued.

In addition to its proper name of Say's Spermophile this animal is called Say's Ground Squirrel, and Big Chipmunk. The Great Golden Spermophile is a closely related species found in the mountains of Wyoming. In habits and general appearance these two are so much alike that we shall consider them together.

In Yellowstone National Park, Wyoming, and in Estes Park, Colorado, Say's Spermophile fairly swarms, in suitable surroundings. It loves the open rocky situations, common in such places where it may be found from about 6000 feet up to timberline. Although it likes the neighborhood of trees and shrubs, it is not a tree-climber; in fact it is rarely seen higher than the top of a stump.

Its favorite home is in crevices in the rocks, and in burrows which it digs. Seeds and acorns furnish most of its food, but it has been known to eat young birds and Meadow Mice. Around camps and houses it eats crumbs and almost any refuse. It tames very quickly, and will eat from a person's hand, climb up his clothing and into his pockets in search of food, much after the same fashion of our Gray Squirrels. In Yellowstone National Park, it is abundant about camp sites where it eats waste grain left by the horses.

Where there are buildings this Ground Squirrel becomes so common as to be a nuisance, as it makes its home nearby or in the buildings and attacks everything edible.

Four to six young are born in the spring or early summer. Until fairly mature they lack the rich cinnamon-brown of the throat and breast of the adult. This is true of the Wyoming species. The more southern species never attains the rich colorings of the northern.

Hibernation takes place in October and lasts until April. Sometimes the animal will burrow through deep snow to get to the surface.

Cheek pouches are greatly developed. Mr. E. R. Warren states that he has taken twenty-seven acorns of the scrub oak from the pouches of one individual. When fed liberally they will put nut after nut into their pouches until it seemed as if they must surely burst. The pouch contents are quickly carried away and hidden, and back the animals come for more. Sometimes they are so numerous about the person feeding them, that there is danger of treading upon them. Some get so fat, through getting so much food for so little work, that they can hardly waddle. In the sandy yellow pine country this Spermophile so constantly utilizes the tunnels of the Mountain Pocket Gopher, that it is continually getting into traps set for Gophers. It is fond of sunning itself in exposed situations during the warmer part of the day, and may often be seen sitting upright and motionless on a point of rock, tree stump, or ridge pole of a cabin. The animals are rarely observed on cloudy days, and they do not come out so early in the morning as

SAY'S SPERMOPHILE

A well-known Ground Squirrel of the Colorado Mountains, that is often a nuisance to settlers and campers the Chipmunks do, but await the warming rays of the sun.

Merritt Cary states that he observed a female and two young, about a third grown, romping among some loose rocks on the banks of Clear Creek, Colorado. "When the old Squirrel first saw me she ran to the little ones and pushed them back into a hole among the rocks with her fore feet. As soon as she had left them the youngsters came out and began playing again. The mother returned and again pushed them into their safe retreat, appearing much excited at my presence. This was continued for a number of times, until I tired of watching the performance."

EASTERN CHIPMUNK

Tamias striatus (*Linnaeus*)

Description.— The Eastern Chipmunk, while formerly classified in the same genus with its host of relatives living in western North America, is now generally placed in a genus by itself because of the following characters. Its back is not so finely striped as the smaller western Chipmunks, nor does it have as many stripes; its size is noticeably larger and its body heavier. It closely resembles a group of western Ground Squirrels, the Say's Ground Squirrel group, but can be quite easily distinguished from the latter through lack of any chestnut coloring on the head or neck. The Eastern Chipmunk is of small size; head rather rounded; ears short but prominent, clothed with short hairs; body trim but not slender; tail broad and flat, moderately bushy, about half the length of head and body; general coloration rusty brown above, with five black and two light-colored stripes on back, and with deep chestnut on rump; underparts whitish. An animal of rather active habits.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{1-1}{1-1}$; Molars, $\frac{3-3}{3-3}=20$.

Pelage.— Adults: Sexes identical. Rather brighter in summer than in winter. Color above reddish-brown or rusty, with some grayish-brown, shading into tawny-brown on cheeks and sides, and with deep chestnut rufous on flanks and rump; five black stripes on back from shoulders nearly to tail, central one bordered by two brownish stripes, and a stripe of tawny-white on each side separating the two outer black stripes. Underparts whitish; tail above, blackish to brownish, fringed with yellow; below, yellowish-brown bordered with black and fringed with gray. Hair everywhere rather short and moderately soft. Young: Like adults, but colors weaker.

Measurements.— Sexes of equal size. Total length, 9.7 inches; tail vertebrae, 3.7 inches; hind foot, 1.2 inches.

Range.— From northern Illinois, Iowa, northward through Wisconsin, Minnesota and Michigan to about latitude 49°.

Food.— Largely seeds, grains, nuts, acorns but also a certain amount of animal food such as young mice, birds' eggs and insects.

Related Subspecies

Eastern Chipmunk.— *Tamias striatus striatus* (Linnaeus). The typical animal of the above description. Southern New York through Atlantic States to Georgia.

Gray Eastern Chipmunk.— *Tamias striatus griseus* Mearns. Large, black markings pronounced, other colors subdued. Upper Mississippi Valley west of Great Lakes.

Lyster's Eastern Chipmunk.—*Tamias striatus lysteri* (Richardson). Rump and thighs bright yellowish-red. From north latitude 50° in eastern North America, south to northern New York, west to Michigan and Ontario.

Bangs's Eastern Chipmunk.— *Tamias striatus venustus* Bangs. Colors brighter and back stripes shorter. Oklahoma.

The Chipmunk may be popularly described as a small edition of the Tree Squirrel. It has much the same shaped head and body, the same bright eye, and the same perky frisk of the tail. In size, however, it is only about one-third the size of its neighbor of the upper stories. It is only about eight or nine inches long, including the long bushy tail; or only five or six inches for the head and body proper.

Chipmunks have also been called Rock Squirrels because of their fondness for making a home among rocky crevices. Failing this convenient retreat, they inhabit fence corners or decayed tree trunks that can be entered from the ground.

Since they are too small to attract the attention of hunters, they have long since ceased to exhibit any lively fear of man. On the contrary, they become easily tamed and may be attracted by any patient passer-by in a woodland, or seen roaming at large in our parks.

Although the Chipmunk ranges over the greater part of North America, there are great tracts of country where it is absent or nearly so. These are the continuous stretches of gloomy forests. A bright, alert, saucy creature itself it is most at home where it may dart into the sunshine at any moment. The rocky, scrubby, dry pastures of New England are ideal for it, especially when scattered clumps of oak, chestnut and beech trees are nearby.

The homes of most burrowing animals are advertised by conspicuous earth mounds at the tops or edges of which the burrows open. The Woodchuck and the Prairie Dog are good examples of this. The Chipmunk, however, is wiser. Not only does it not make such mounds, but it takes pains not to make paths leading to the mouth of its burrow. Probably this is done by approaching the burrow from as many different directions as possible, and by moving in long wavelike leaps. The burrow openings, too, are often placed in inconspicuous spots, such as under the edge of a stone, or under a stump or tree root. Considerable cunning is exercised in the making of the Chipmunk's home. The burrow may be started in an open spot and run in various directions with chambers of different sizes, up to a foot in length, placed here and there. Eventually the tunnel has at least two other entrances besides the original one. This is finally closed up, and only hidden openings are left. Just how the Chipmunk carries the dirt from the tunnels and chambers to some distance away, is a disputed point. Some naturalists believe the large pouches are used only for carrying food. The use for conveying dirt is possible. To carry such a large amount of dirt to considerable distances in the fore-paws would require a long time. The burrows are about two inches in diameter, several yards long, and from a foot or less to three or four feet below the ground surface.

If one can think of a Chipmunk with a bad case of mumps, one would have a good conception of that animal with its cheek pouches filled with food. When full these pockets nearly treble the size of the head. As many as four hickory nuts have been found in them. Like a small boy's pockets these pouches may be filled with all kinds of edibles, especially vegetable matter. Acorns, hickory nuts, beech nuts and all kinds of seeds and grain form a large part of the vegetable menu; while insects in their various stages, bird's eggs and young, and other freshly killed animals of many kinds find a place in its dietary at times.

August, September and October are the harvest months for Chipmunks. Then they are very busy gathering seeds and nuts and storing

Photograph by G. W. Stark

EASTERN CHIPMUNK

A bright-eyed, alert little rodent that has been called the fairy of the mammal world

them in underground granaries connected with their burrows. Over half a bushel of such food has been taken from a single chamber, and it is a common thing to find several quarts in one place. Sometimes a few nuts are deposited by digging a slight distance below the ground surface in the same way that Gray Squirrels store food. These, however, seem to be only temporary deposits which are soon eaten or taken to the main granary. No food of an easily perishable character, like grasshoppers, is stored.

Photograph by J. M. Johnson

EASTERN CHIPMUNK

Caught sunning himself on a stone wall

There is considerable difference of opinion in regard to the use of this reserve food. Is it eaten during the long winter months underground, or does the Chipmunk sleep then and use the supply in the early spring when other food is scarce? Unlike many other hibernating animals, the Chipmunk is not particularly fat on retiring to its burrow. It is probable that it eats some of its stores at that time in order to get into good condition for its long sleep, leaving the bulk of it for its spring breakfast. The period of hibernation varies with the latitude. In New York it is from about October first to April first, the length of time depending upon the severity of the season.

The final awakening comes with a rush. When the Chipmunk emerges from its burrow there is no sign of long sleep. Then is the time for love making and for mating. It is probable that Chipmunks pair at least for one season. The four or five blind, naked young are born about a month after the mating of the parents, and may be seen in the upper world in late May or in June according to the latitude. There is some evidence that two litters may be produced in a season.

In addition to its other accomplishments the Chipmunk sings. Those of a given locality will gather and sing their chirping notes for many minutes together, sometimes loud and cheery, sometimes soft and in a conversational tone. From this "chip, chip, chip!" has come the name. With its airy grace, its quick alert movements, its shiny eyes, its bright coloring and its happy notes, the Chipmunk is the veritable fairy of the mammal world.

Like most rodents the Chipmunk's enemies are many. All the larger birds of prey find it a choice morsel. Carnivorous mammals get it whenever they can. Badgers will even dig out burrows to get it. The deadliest enemy of them all, however, is the Weasel. Wherever the Chipmunk can go the Weasel can follow, and the only chance of escape left to the pursued animal is to plug up its burrow with dirt.

We should miss the Chipmunk sadly were it exterminated, yet it is necessary to keep the numbers within moderate limits, because of the many young birds which would become its prey, if it were not kept in check. While it does not climb to any extent, it does scent out low-built nests. The damage done to grain in most parts of the country is slight, and is more than repaid by the pleasure of its cheery company.

J. M. Johnson.

SAY'S CHIPMUNK

Eutamias quadrivittatus *(Say)*

Other Name.— Busy Chipmunk.

General Description.— Say's Chipmunk may be selected as representative of the whole genus *Eutamias*, a very large group ranging in general over almost all of North America. The latest authoritative list records no less than 47 species and subspecies of this small mammal known north of the Rio Grande. Roughly speaking they are all very much alike, most of them having the upper parts striped with the same pattern, namely 5 dark and 4 lighter, dorsal, longitudinal stripes. However, owing to the great variety of habitats in which Chipmunks live, the greatest diversity is found in coloration and to a certain extent in size. This group is a very plastic one, that is, its members reflect readily the environmental influences about them, and thus in desert species we find very pale coloration as the result of excessive sunlight, while in regions of heavy rainfall dark, rich-colored forms occur. As might be expected, certain changes of habit are also correlated with changes in environment, although the economic niche fitted by this animal is much the same wherever it is found. Say's Chipmunk is small and slender, being only about half the bulk of the Eastern Chipmunk. Head moderately rounded; ears somewhat narrow, erect and well clothed with short hair; body slender and trim; tail about as long as head and body, and moderately bushy and flat; legs short. Color above, a series of dark and light stripes; hair of moderate length and soft. Very active and excitable in manner.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{2-2}{1-1}$; Molars, $\frac{3-3}{3-3}=22$.

Pelage.— ADULTS: Sexes identical. *Summer* pelage. Above, grayish grizzled chestnut or rufous with conspicuous longitudinal striping as follows: a median black stripe extending from between ears nearly to base of tail; on either side of median stripe, a lighter stripe of nearly same tone as color of sides, or more often, grayish-white; then a black stripe, edged with rufous and ending about an inch behind ear; finally an almost clear white stripe; behind ears a small patch of whitish-gray; grayish-white stripes above and below eyes; dark facial stripes; top of head gray; under surface of body white, the hairs blackish at base; tail above, mixed black and rufous; below, rufous, black bordered. *Winter*. The whole general tone of the upper parts grayer, with dorsal stripes less black and more rufous, and light stripes grayer; sides and flanks duller; under surface of tail more chestnut. YOUNG: Striped like adults but coloration weaker.

Measurements.— Total length, 8.5 inches to 9.5 inches; tail vertebrae, 3.7 inches; hind foot, 1.3 inches.

Range.— Southern Colorado northward through Wyoming, in forested regions and brushy places.

Food.— Seeds of various kinds, acorns, some insects and birds' eggs.

RELATED SPECIES

Say's Chipmunk, or Colorado Chipmunk.— *Eutamias quadrivittatus quadrivittatus* (Say). Typical animal of the above description. Colorado and Wyoming.

Yellow-bellied Chipmunk.—*Eutamias quadrivittatus luteiventris* (Allen). Colors bright; body beneath buffy. Rocky Mountains in Montana northward into British Columbia.

Northern Chipmunk.—*Eutamias quadrivittatus borealis* (Allen). Smaller than Colorado Chipmunk; pale yellowish-gray above. Northern North America, Hudson Bay to eastern base of Rocky Mountains south to Montana.

Least Chipmunk.— *Eutamias minimus minimus* (Bachman). Smallest of the Chipmunks, length 8 inches. Colors very pale. A desert form. Bad Lands and plains of Dakota, Montana and Wyoming.

Oregon Chipmunk.— *Eutamias amoenus amoenus* (Allen). Smaller in size than Colorado Chipmunk, colors paler. Fort Klamath, Oregon to northern California and western Nevada.

Utah Chipmunk.— *Eutamias dorsalis utahensis* Merriam. Single dorsal stripe alone conspicuous; coloration rusty brown. Northern Utah to New Mexico.

Townsend's Chipmunk.—*Eutamias townsendii townsendii* (Bachman). Largest of the Chipmunks; coloration very dark; above ferruginous rufous; tail about three-quarters length of head and body. Coast region of Oregon, Washington and British Columbia.

Merriam's Chipmunk.— *Eutamias merriami merriami* (Allen). Size large; colors pale; stripes not strikingly contrasted. California.

Hopi Chipmunk.— *Eutamias hopiensis* Merriam. Medium size; general appearance bright chestnut or rufous. Northern Arizona, southern Utah and southwestern Colorado.

Long-eared Chipmunk.— *Eutamias quadrimaculatus* (Gray). Size large; facial stripes very distinct; ears large; coloration grayish. California.

Busy is just the word to characterize this little Chipmunk. From morning until night he is on the move in whole or in part. Now he is dashing from his burrow to disappear in a rock pile, only to bob his head out a moment later. Now he skips quickly to a bush of bright red berries, and branch after branch shakes as he goes from one to another gathering his breakfast. Some he takes to a nearby boulder, sits up and proceeeds to eat, holding and turning the berries in his hand-like fore-paws much as a person would do. So he goes all day long.

The Chipmunk's tail seems to have some hidden connection with his vocal cords. Up goes his tail, out comes a whistling bark, down jerks his tail, out comes another bark. He never whistles or barks without a jerk of the tail. It seems to be a trigger to set off his emotions.

The "Say" Chipmunk is one of several species found throughout the West, and often varies externally only slightly in color. An expert naturalist can hardly determine the members of the different races in the field where the ranges of two or more overlap. The main characteristics of this form, therefore, will be those of all. Food, of course, will vary somewhat with the locality. That of the desert will be somewhat different from that of the mountains. The Western form of Chipmunk is even less a creature of the woods than its Eastern relative. It is seldom found in trees, while the Eastern cousin has been seen running up small trees after food. The open country is more suited to its taste, with trees and berry bushes scattered about, and plenty of rock-strewn, sunny spaces between. In these spaces it finds holes among the rocks for its home, or it may make a burrow.

Acorns, seeds of pine and of spruce trees and various other seeds furnish its principal food. It is likely however, that it will eat insects and young birds when the occasion offers.

In autumn it lays up a generous supply of food, and when the weather begins to get cold the Western Chipmunk, like its Eastern cousin, takes to winter quarters, curls up and sleeps. In parts of Colorado it seems to break its slumber occasionally, as it has been seen every month during mild winters.

Photograph by J. M. Johnson

SAY'S CHIPMUNK

Busy is just the word to characterize this little fellow. From morning to night he is on the move

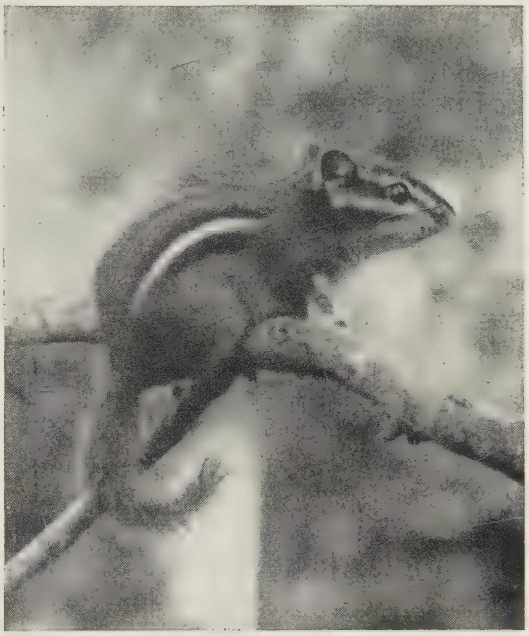
Four to six young appear in spring or early summer according to the altitude. Where camps are established, mills built or a new section of country is irrigated, the Chipmunks are sure to swarm to get the extra food afforded by the refuse thrown out, or by the extra grain raised. In Yellowstone National Park a closely related species is very abundant at the camping places established at intervals along the roads. The attraction is the waste grain and the camp refuse. In such places they become very tame, even to the point of eating out of a person's hand.

Like most Chipmunks the Say is out in greatest abundance during the early morning hours or late in the afternoon, and may be seen frisking about the rocks and stumps of trees, on the sides of canyons, or along fences, or busily feeding in the thickets of wild cherry and June berry so abundant in the canyon bottoms. It is usually shy, and when surprised hastily takes refuge among the rocks, uttering high-pitched chippering notes. The ordinary note, however, is a soft "chuck, chuck," usually uttered when the animal is at a distance from the observer and either sitting on the summit of a large rock far up the canyon side or on a tree stump in the silence of the yellow pine forest.

The *Hopi Chipmunk* gets its name from the Hopi Indians near whose reservations it is found. It is at home in the cedar and pinyon pine regions of parts of Arizona, Utah and Colorado. It is darker than the Least Chipmunk, but lighter than the forms living in the forested plateaus and mountains. Its general habits are similar to others.

In size and general appearance the Hopi Chipmunk resembles Say's, but its movements are more deliberate and its colors much brighter and richer. The long tail is carried more nearly horizontally, even when the animal is running. This striking habit, together with the graceful downward curve of the tail near the tip, serves to distinguish it, even at a distance. The Hopi Chipmunks appear equally at home among the hot rocks in the precipitous canyons, and in the dense juniper and pinyon growth which clothes the bordering mesas. They feed extensively upon juniper berries.

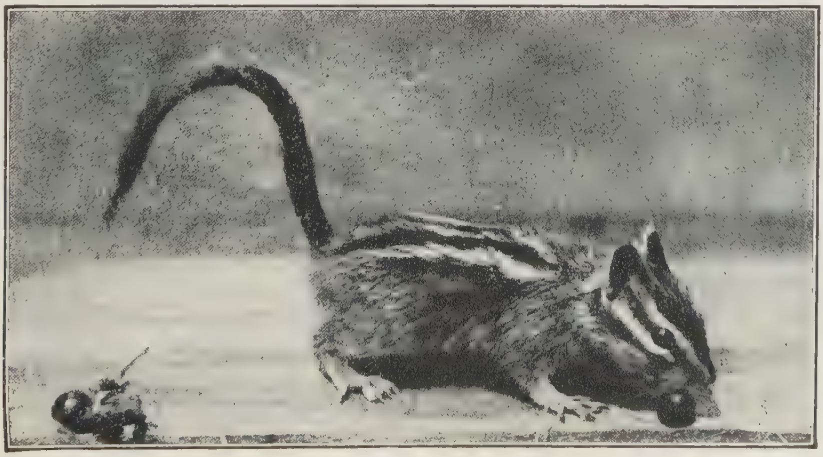
The *Least Chipmunk* is another of the several species and subspecies which make the region west of the Mississippi River their home. The greater diversity of the climate and country results in a greater variation in animal forms inhabiting it. One species will live in the very lofty mountains, another in the sagebrush desert, and the third in the prairie regions. This Chipmunk has the same general appearance as the other Western Chipmunks, but is much lighter in ground color, as might be expected from the fact that it lives in the sagebrush deserts of parts



Photograph by J. H. Field

BANGS'S CHIPMUNK

A middle-western member of the Eastern Chipmunk group



Photograph by the U. S. Biological Survey

YELLOW-BELLIED CHIPMUNK

of Montana, Wyoming, Colorado and Utah. It is interesting as being the smallest of all the Chipmunks. Ordinarily it is shy, but it soon becomes tame about camps if not molested.

Townsend's Chipmunk is a large dark form found in the coast regions of British Columbia, Washington, Oregon and California. The light and dark stripes are not nearly so pronounced as in the Say Chipmunk, or the other closely allied forms. This is the largest of all the Chipmunks.

EASTERN WOODCHUCK

Marmota monax (*Linnaeus*)

Other Names.— Eastern Marmot; Groundhog.

General Description.— A large, heavy-bodied, short-tailed terrestrial Squirrel. Nose blunt; head rounded; ears low and rounded; body robust and generally fat; tail short, less than half the length of head and body, moderately bushy; legs short; hair everywhere rather long and coarse; front feet with four well-developed toes and a rudimentary thumb; hind feet with five toes; general color grizzly-brown. Hibernates in winter.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{2-2}{1-1}$; Molars, $\frac{3-3}{3-3}=22$.

Pelage.— ADULTS: Sexes identical, no marked seasonal variation. General color grizzly brown, the hairs on the back with gray tips and blackish at base; belly and underparts brownish-chestnut; nose and chin gray; cheeks and throat yellowish-white; feet black or dark brown; tail dark brown with gray tips to many of the hairs. Variations on this typical coloration are not infrequent, some individuals being much darker. YOUNG: Pale brownish.

Measurements.— Total length, 22 to 25 inches; tail vertebrae, 5 to 6 inches; hind foot, 3.4 to 3.7 inches. Weight about 8 pounds.

Range.— From New York to Georgia, west to the Dakotas and south to Virginia, Kentucky and Tennessee.

Food.— Green vegetation, roots and grain.

Remarks.— Woodchucks are closely related to the Prairie Dogs and Ground Squirrels, or Spermophiles, but may be easily distinguished from any of these by their large size, as they are without question the largest squirrel-like mammal of North America. Ranging over a great part of our continent north of 35° latitude to the Arctic circle, the Woodchuck has become well differentiated into several distinct types, and in addition, local variations of these types have been described, making in all thirteen species and subspecies.

RELATED SPECIES

Eastern Marmot.— *Marmota monax monax* (*Linnaeus*). The typical animal as described above.

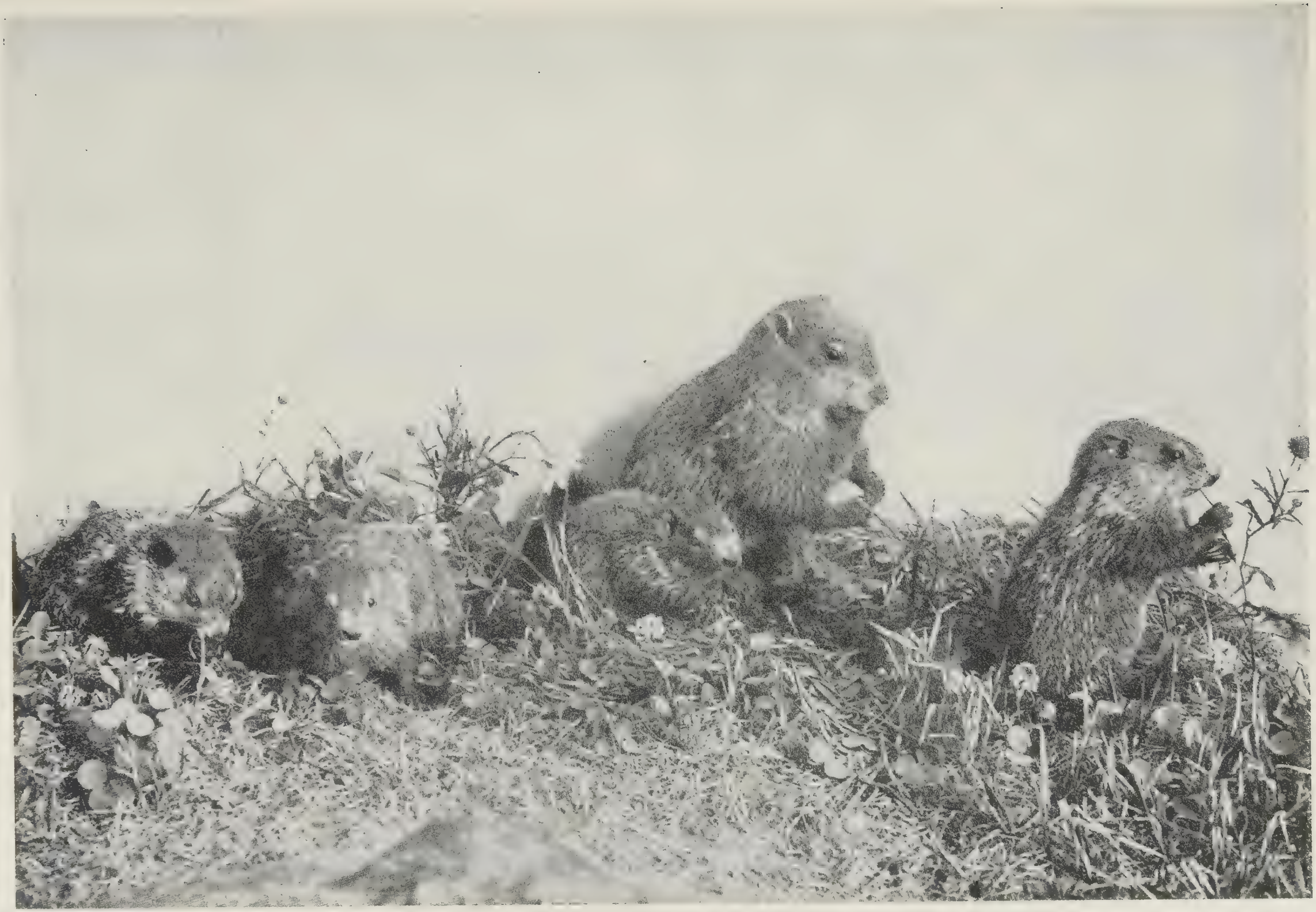
See also Hoary Marmot, and other western forms.

Every farm boy and girl knows the Woodchuck, for he is as much a part of the farm as the brook or the sugar-bush. In a tramp through the fields almost any time during the spring or summer, one is likely to catch a glimpse of him as he waddles away to his burrow, or possibly to his den in the wall or stone-heap, which he sometimes prefers for a summer home. Those who know him well can easily distinguish his home by the peculiar odor which is always present.

When our grandfathers were boys the Woodchuck usually had his home in the woods, where he fed on the tender bark and roots of various kinds, but today we find him more inclined to the fields, near the farmer's clover-patch. There is a touch of laziness in his disposition and probably he finds the clover-patch an easier place to get his living. Then, too, it is nearer the garden where he can occasionally taste the juicy peas, beans, and lettuce, of which he is very fond. But he has greatly added to his danger by this change, for here the farmer continually wages warfare against him from early spring until fall. Many are trapped, some are shot, and others are killed by farm dogs.

Trapping is easier in May or June than later in the summer when experience has made them wise and timid. Sometimes, leading from the burrow is a well-defined path through the grass, and in this the trap is set, but usually it is placed at the entrance of the burrow and made fast to a stake which is driven into the ground. Old Woodchucks at last become very shy and develop great skill in detecting and avoiding the dangers of the traps. Sometimes one of them will spring a trap day after day without being caught, or even dig around the trap.

After the grass has been mowed in the meadows and he can no longer hide himself, the Woodchuck becomes still more shy, for he must now look out for the farmer and also the village sportsmen, who often betake themselves to the



Photograph from the American Museum of Natural History

A FAMILY OF EASTERN WOODCHUCKS

This is a still life group which shows both old and young animals in characteristic attitudes country on leisure afternoons, to indulge in Woodchuck hunting.

Then, too, he must reckon with the farm dog, which frequently develops great ability in nosing him out. A certain dog by the name of Shep, well known to the writer, was a famous Woodchuck hunter. Shep would locate a Woodchuck, and then, while it was feeding, would move quietly toward it, always keeping her body close to the ground, but stopping instantly and lying still whenever the Woodchuck raised himself upon his haunches to look about and listen for danger. This performance was repeated by Shep until she believed that she was near enough to the burrow to prevent the Woodchuck from reaching the entrance first. Finally she would make a dash for it, and usually there was one less Woodchuck.

Photograph by F. N. Whitman

"TAKING A GOOD LOOK"

Characteristic pose of a fat, lazy Woodchuck who unwittingly sat for his portrait

The real home of the Woodchuck is the tunnel or burrow in the ground, which varies in length from ten to twenty-five feet, and is two or three feet below the surface. The entrance to the burrow slants sharply down and then up to the general level, which secures better drainage. The Woodchuck is somewhat of an engineer, though not so good as the Beaver, and realizing the importance of drainage, most frequently chooses the hill-slope site. The main burrow ends in a chamber of sufficient size for the occupants to turn around comfortably. There may be one or more side tunnels, varying in length from three to five feet. Frequently at the end of one of these is an observation outlet, which also may be used in times of invasion by other animals, such as the Fox, Mink, or Skunk.

The home life of the Woodchuck, as well as that of other animals, is most interesting. The writer was fortunate enough to know quite well one Woodchuck family. They lived by the old rail fence, just back of the orchard on a sunny slope, the mother and five little ones. The cubs were born about the first of May in a snug little chamber, at the end of the main burrow, containing a small bed of dry grass and leaves gathered the fall before by the mother. The mother made herself known by a shrill whistle of alarm at Rover and his boy master as they were on their way to the trout stream one rainy morning in early June. The dog ran quickly in the direction of the sound and was soon at the entrance of the burrow, thrusting in his head, wagging his tail, and uttering the short, quick yelps so characteristic of the shepherd dog.

The mother was too thoroughly frightened to venture out again, probably for an hour or more, but one day a little later she appeared at the door of the earth-castle, and the five cubs came tumbling along the narrow passage after her. It was evidently the first time they had opened their great wondering brown eyes on the outside world. The sweet odors from the meadows whispered to their awakening instincts of the clover and grasses they would soon be hunting for themselves. The song of the wren from the old orchard, the merry tune of the bobolinks, the whistle of the meadow lark, and the buzz of insects told them of other dwellers in their new world.

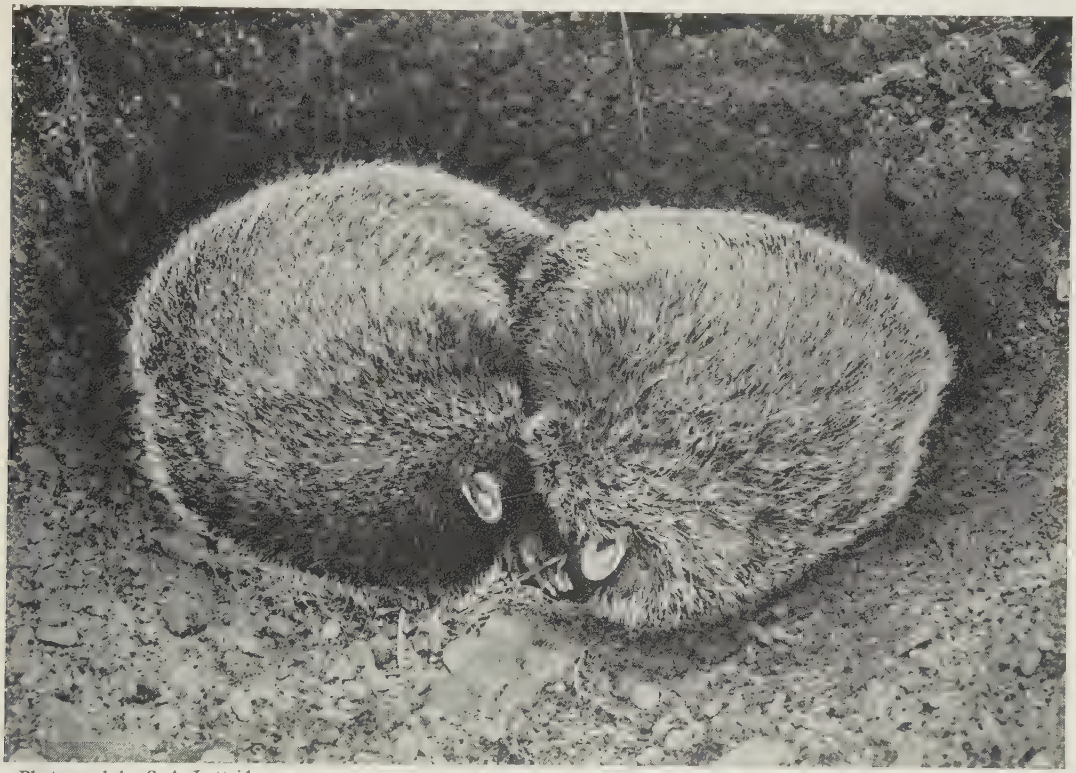
The mother was more alert than usual for all sounds which threatened danger to her family, and did not venture from the entrance until a thorough survey of the surroundings had been made. When satisfied that danger was not lurking in the immediate vicinity, she led the way into the grass and began nibbling the clover leaves. Instinctively imitating her, the cubs followed close after their mother and also began nibbling the juicy leaves with their sharp little teeth. They were learning their first lesson in the meadow — how to eat.

The real object of their outing was accomplished when they had filled their stomachs, and then they began playing about in the grass very much like puppies or young foxes, but the mother was careful meanwhile to keep them close to the entrance of the burrow. Suddenly the trained ear caught an unwelcome sound and she hustled the little ones into the burrow and quickly followed. They were scarcely safe when a dog appeared over the knoll, running straight for them. The cubs could have traversed but a part of the tunnel before they heard the deep breathing of the dog at the entrance of the burrow. Their hearts must have beat fast from the excitement and unusual exertion, but the experience had added one more fact to their first day's lesson, and they understood that there were animals to be avoided in the strange outer world they had just discovered.

Their education progressed rapidly from day to day. A part of it came through imitation of their wonderful mother, but by far the greater part came through instinct and experiences of their own. They learned to tell the clover from the plantain, and to know the grasses that were good for food and medicine, from those that must be let alone. They could distinguish among the sounds that came to their ears, those that threatened danger from others that meant no harm. One of the most important lessons was on the nature of their natural foes.

In early fall the young Woodchucks were nearly full grown. Their education was complete, and the time drew near when they must find homes for themselves, either taking a deserted burrow, or digging a new one, and settle down to the serious business of life.

Usually each young Woodchuck has a burrow by itself, but sometimes a pair will live together during the winter. From October to March, in general, the Woodchuck is said to "hole up" or "den." This means passing the dreary winter months of sleet and snow in the deep sleep called hibernation.



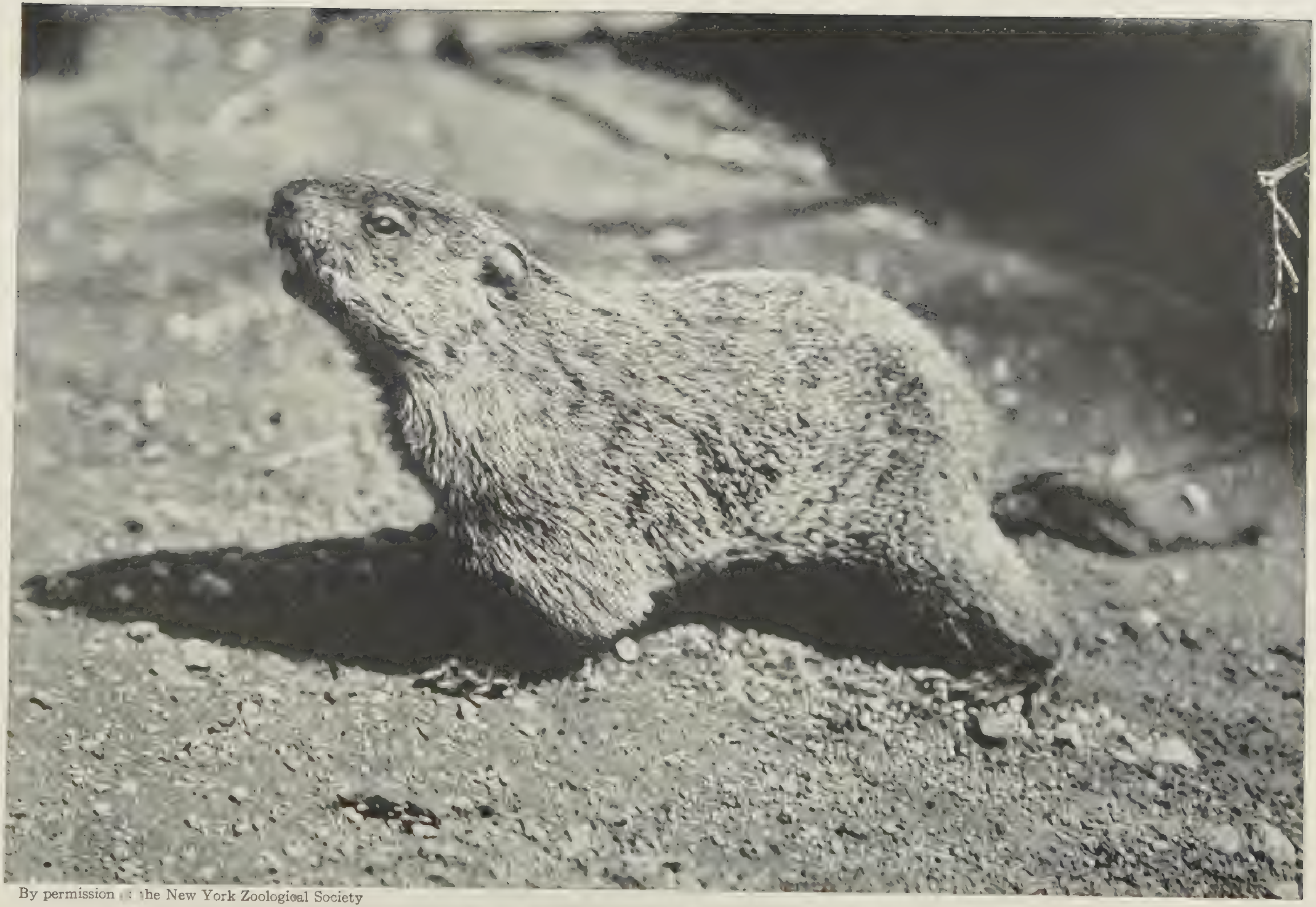
Photograph by S. A. Lottridge

WOODCHUCKS HIBERNATING

A remarkable life photograph, in that it not only shows the actual animals asleep, but also that they may hibernate in pairs, for warmth, instead of singly, as is generally supposed

The Woodchuck is the only animal that has been honored by a special day on our calendar. "Ground Hog Day" (February 2) is so called because of the popular belief that, on this day, the animal takes its first weather observation after its long winter sleep. If it sees its shadow (that is, if the sun is shining) back it pops into its hole, and we are in for six weeks more of winter.

S. A. Lottridge.



By permission of the New York Zoological Society

EASTERN WOODCHUCK

This was one day when the Groundhog, as he is familiarly called, could see his shadow. Photograph one-fifth life-size

HOARY MARMOT

Marmota caligata (*Eschscholtz*)

Other Names.— Gray Marmot, Whistling Marmot.

General Description.— Much larger than the Eastern Marmot, or Woodchuck, but with the same general build and habits.

Dental Formula.— Same as foregoing.

Pelage.— ADULTS: Sexes identical, no marked seasonal variation. General color much lighter than Eastern type. Above, grayish-white, the tips of hairs having pronounced grizzled-whitish tinge. Sides and underparts shading from grayish-fulvous to black. YOUNG: paler.

Measurements.— Total length, 29 inches; tail vertebrae, 7 inches. Weight, 10 pounds.

Range.— Columbia River northward to the Barren Grounds, east to Hudson Bay.

Food.— Roots, small plants, seeds, and grain.

RELATED SPECIES

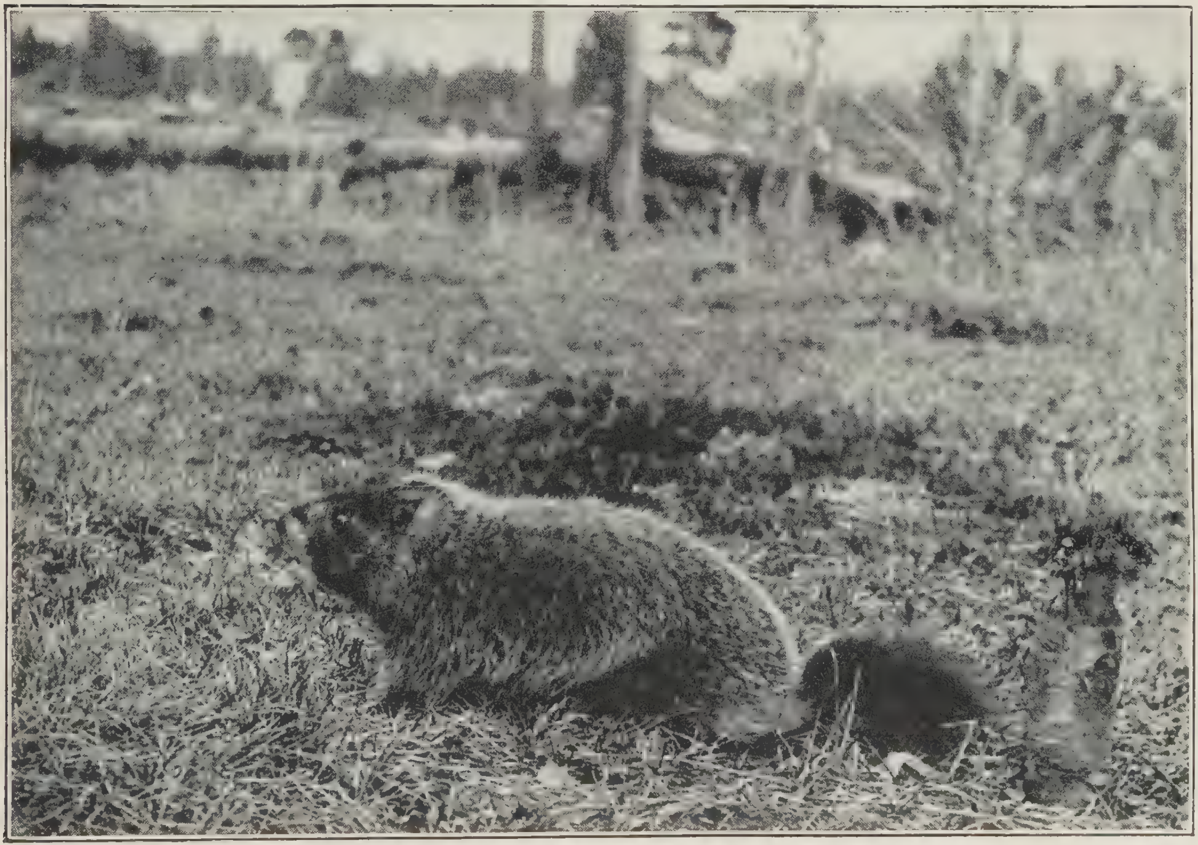
Hoary Marmot.— *Marmota caligata* (Eschscholtz). Typical animal of above description.

Eastern Marmot.— *Marmota monax monax* (Linnaeus). See preceding article.

Yellow-bellied Marmot.— *Marmota flaviventer flaviventer* (Audubon and Bachman). Size large, coloration much as in Eastern Marmot, underparts golden, tail rusty yellowish. Western Texas, New Mexico and Arizona north to 49°.

Dakota Marmot.—*Marmota dacota* (Merriam). Size large; hairs on shoulders elongated to form a mantle, yellowish-brown mixed with black above; head black. South Dakota.

Olympic Marmot.— *Marmota olympus* (Merriam). Size equal to Hoary Marmot; yellow ochraceous above; dark bar across face. Olympic Mountains, Washington.



Photograph by U. S. Biological Survey

YELLOW-BELLIED MARMOT

A large western type which can be readily distinguished by the beautiful golden tint on its underfur

The Hoary Marmot and its western cousins are in general considerably larger than the Eastern Woodchuck, but can be readily recognized even by the casual passerby as near relatives of that familiar animal. In colors the western members range from the grizzled gray of the Hoary Marmot, which ranges the Canadian Barren Grounds, to the Yellow-bellied Marmot of the Southwest, a beautifully marked animal that can be readily distinguished by the golden hue of its underfur. Here once again we see the protective coloring afforded by nature. In the northern wastes the animal is given the indiscriminate gray which blends so perfectly with the landscape; while in the southern deserts it reflects the hues of sand and rocks.

The general habits resemble those of the Eastern type, with such changes as may be made necessary by locality. For example, in the far North the period of hibernation is very long, because of the length of the winter; while in the southern deserts it is doubtful if the Marmot hibernates at all. A noteworthy feature about the whole tribe is their ready adaptability to almost every climate. They seem to thrive almost equally well in southern climes and in frozen wastes as high as latitude 63°. They are found on the deserts and also on the very tops of mountain peaks. Says Merritt Cary: "The Marmot is one of the most characteristic mammals of the mountains, and occurs from 6000 feet in the foothills to the rocky summits of the highest peaks, at over 14,000 feet. It has, therefore a vertical range of about 8000 feet. Marmots are much more abundant above than below 8000 feet, and are especially numerous in the slide rock near timberline. They are reported present on the summit of Gray's Peak, at an elevation of 14,341 feet, and have been observed also on the summit of Long's Peak 100 feet lower. The clear, shrill whistle of the Marmot is one of the few sounds that break the silence of the high altitudes, and the large reddish-brown animals may often be seen sunning themselves on the warm, flat surface of rocks during the middle of the day. In the Hahn's Peak region Marmots are abundant, and are usually seen around abandoned prospect holes and mining shafts."

The Hoary Marmot is also called the Whistler, from its call — a shrill whistle used not only as a danger signal but as a means of communication at all times. It seems, in fact, quite proud of its vocal efforts, which are often practiced continuously, and its pleasant call has cheered many a lonely traveler.

PRAIRIE DOG

Cynomys ludovicianus (*Ord*)

General Description.— A stout-bodied, terrestrial Squirrel of the Plains regions. Head blunt, rounded; ears low and broad; body thick set; tail very short, about one-third length of head and body, slightly bushy; legs short; claws long; general color, reddish-brown grizzled with grayish above; beneath, yellowish-white; hairs fairly long and coarse. Lives in colonies.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{2-2}{1-1}$; Molars, $\frac{3-3}{3-3}=22$.

Pelage.— Adults: Sexes identical. *Summer.* Above, reddish-brown, brightest and clearest on shoulders and top of head, on back and rump, grizzled with black and white; flanks paler; sides of head and body and upper surfaces of feet, yellowish; underparts yellowish-white; tail above and below like shoulders, with apical third black. *Winter.* Above, pale vinaceous buff, grizzled and mixed with black; below pale buff. Young: A paler brown.

Measurements.— Total length, 14 inches; tail vertebrae, 3 inches; hind foot, 2.3 inches.

Range.— Western Texas to 49th parallel, and western Kansas as far east as the eastern base of Rocky Mountains.

Food.— Largely grass, roots and blades, and other vegetation.

Related Species

Common Prairie Dog.— *Cynomys ludovicianus* (Ord). Typical animal as described above. Western Texas to 49° north latitude, and from western Kansas to eastern base of Rocky Mountains.

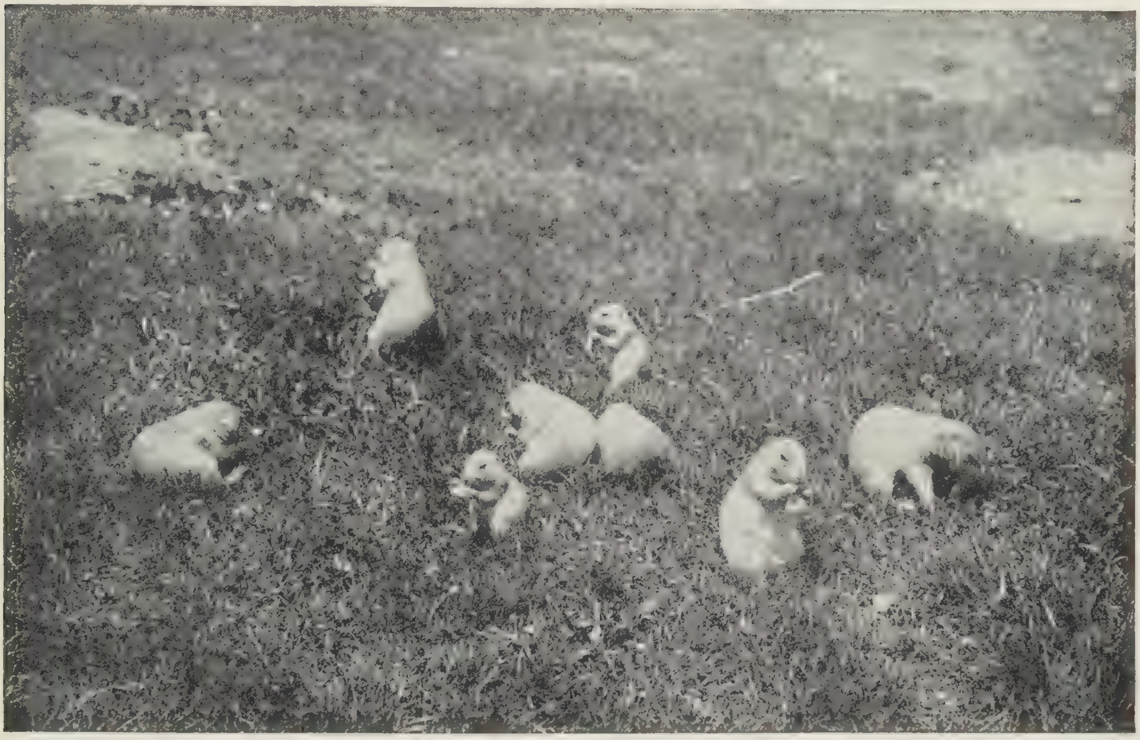
Gunnison Prairie Dog.— *Cynomys gunnisoni* (Baird). Darker in color; tail tipped with white. New Mexico and Colorado to Arizona.

Arizona Prairie Dog.— *Cynomys arizonensis* Mearns. Largest of the Prairie Dogs; pale sandy buff above; tail with narrow sub-terminal bar of black. Texas and Arizona.

White-tailed Prairie Dog.— *Cynomys leucurus* Merriam. Size large, tail like back at base, but outer two-thirds white with a few black hairs. Wyoming and Colorado.

The Prairie Dog lives upon and just under the surface of the ground. It is not a climbing animal, but devotes its surplus energies to burrowing. It is of social disposition and is always to be found in colonies often of large size. It is related, on the one hand, to the Spermophile, and, on the other, to the Marmot, but may be easily distinguished from either of these by the markings outlined above. The name "Dog" as applied to this animal is, of course, inaccurate, as it is a true rodent.

Ever since the first explorers penetrated the Western plains, these sociable little beasts have been known and liked, despite their propensity for mischief. Today as one looks out of the car-window, he will be rewarded by seeing a little inquisitive head pop out of a hole, or a sentinel-like animal sitting gravely at his threshold as though monarch of all he surveyed. In commenting upon this trait, an early explorer says: "This interesting little animal never fails to attract the attention of every traveller on the Western plains; and an approach to one of their settlements, after long and dreary marches, is always hailed with delight as a pleasant change from the monotony of lifeless scenes to one of cheerful activity and motion. Such occasions excite a certain degree of pleasure in every one as he watches the motions of these curious creatures as they at first assemble in numbers, as if in grave consultation in regard to the intrusion of strangers upon their quiet domain. Upon the too near approach of apparent danger, suddenly the assembly is dispersed, each one retires to his respective home and standing upon the edge of his den, utters his peculiar bark as if in defiance; and then every one disappears suddenly and every voice is hushed when a single gun is discharged."



By permission of the New York Zoological Society

PRAIRIE DOG COLONY

A characteristic picture of Prairie Dogs showing how they cut and hold their food

Prairie Dogs are easily introduced into almost any open country where the ground is dry, but they are very difficult to exterminate. They breed readily in captivity, and usually produce four young at a birth. In 1899, says Dr. Hornaday, a free colony was established in the New York Zoological Park in the Antelope Range, where it existed for two years, and its saucy members attracted far more attention than those confined in the fenced village. Knowing that guns and dogs were not allowed in the Park, they often permitted visitors to pass within six feet of them. But it proved impossible to keep those industrious diggers from spreading far beyond the limits fixed for them, and seriously damaging walks and lawns, so they were finally caught by placing sand in boxes over their burrows, and transferred to the village whose walls of solid masonry go down to bed rock.

Photograph by P. C. Kangieser

PRAIRIE DOG

These rodents are among the most familiar animals of the Western plains. This photograph was taken in Kansas

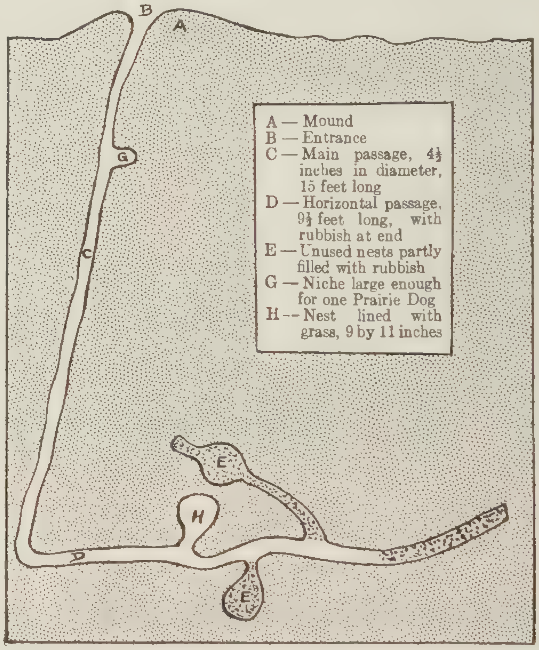
It has been asserted that these interesting little fellows are able to locate their towns away from streams because they burrow down until they strike water, but Dr. Merriam points out the fact that in some regions they live where the nearest veins of artesian-well water are 1000 feet below the surface. As a matter of fact they can live without drinking.

The Prairie Dog flourishes over a wide extent of western country, from Texas, New Mexico and Arizona northward to the Canadian boundary. It is also at home on the western slope of the Rocky Mountains in Utah and Colorado and is most abundant in Montana, Wyoming and western Kansas. One of the largest Prairie Dog towns yet reported begins in Trego County, Kansas, and extends along the divide north of the Smoky Hill River, practically without a break, to Colorado, a total distance of about 100 miles. This town varies in width from half a mile to five miles, and on the top of the divide the nearest water is believed to be 350 feet below the surface.

It is not true, says Dr. Hornaday, that the Prairie Dog lives in peace and harmony in the same burrow with the rattlesnake and burrowing owl. The snakes would make short work of the young Dogs, and the latter would quickly kill the owl! When a quarrelsome rattler invades the home, the Prairie Dog speedily seeks quarters elsewhere. The burrowing owl is in the habit of taking refuge in abandoned burrows, and nesting in them, to save the labor of digging a burrow for itself. In the Philadelphia Zoological Garden Mr. A. E. Brown once tried the experiment of associating burrowing owls and Prairie Dogs. The owls were immediately killed and torn to pieces.

In the "Yearbook of the Department of Agriculture" for 1901, Dr. C. Hart Merriam publishes a valuable paper on "The Prairie Dog of the Great Plains," which contains the following illustrated description:

"The holes go down for some distance at a very steep angle and then turn at nearly a right angle and continue horizontally, rising somewhat toward the end. The nests are inside the chambers connecting with the horizontal part of the burrow, and usually, if not always, at a somewhat higher level. Recently, at Alma,


B
A
G
C
E
H
D
E
A — Mound
B — Entrance
C — Main passage, 4½ inches in diameter, 15 feet long
D — Horizontal passage, 9½ feet long, with rubbish at end
E — Unused nests partly filled with rubbish
G — Niche large enough for one Prairie Dog
H — Nest lined with grass, 9 by 11 inches

PRAIRIE DOG BURROW

This diagram made from actual measurements of an excavated burrow, by Dr. C. Hart Merriam, and published in the Yearbook of the U. S. Department of Agriculture, for 1901, is an excellent "ground plan" of this sociable rodent's home. It is remarkable for the great depth and length of the tunnels

Nebraska, W. H. Osgood dug out a burrow, of which he made a careful diagram, accompanied by measurements.

"In this case the burrow went down nearly vertically to a depth of fourteen and one-half feet below the surface when it turned abruptly and became horizontal. The horizontal part was thirteen and one-half feet in length. One-third of the horizontal part and two old nests and passage ways were plugged with black earth brought in from the surface layer, which was very different from the light-colored clayey earth in which the greater part of the burrow lay.

"Four or five feet below the entrance was a short side passage probably used as a place in which to turn around when the animals come back to take a look at the intruder before finally disappearing in the bottom of their burrows. It was also used, apparently, as a resting-place where they bark and scold after retreating from the mouths of the burrows. As elsewhere noted, they are often heard barking after they have gone in.

"The burrow was opened the day after bisulphide of carbon had been used for destroying the animals, and the material carrying the bisulphide was found at the bottom of the vertical part, just where the horizontal part turns off.

"The Prairie Dog has several natural enemies which, when not interfered with by man, usually serve to hold its members in check. The most inveterate of these appear to be the coyote, badger, ferret and rattlesnake."

The *White-tailed* is not unlike the *Gunnison* Prairie Dog in size and general coloration, but may be readily distinguished from the latter by its white tail and by the broad dusky patch which covers the eye and extends down over the cheek. Merritt Cary says of this species: "It is not extensively colonial, the burrows being scattered here and there over the sage plains. The burrows are apparently occupied for many years, and the ejected earth accumulates into very large mounds, often as much as three feet in height and eight or ten feet in diameter. These Prairie Dogs are not very shy and often sit at the mouth of the burrow until approached within a rod. The usual note is a peculiar querulous cry, very unlike the short sharp bark of the common type. Chattering alarm notes also are occasionally heard as one walks through a colony.

"Wherever White-tailed Prairie Dogs live in the neighborhood of cultivated ground they are very injurious to green crops. Loring states that in the vicinity of Grand Junction, Colorado, the burrows are usually in the dry banks of irrigating ditches, and the Prairie Dogs inflict considerable damage on the adjacent truck farms by eating cabbages, cantaloupes, and other crops. While eating, they sit erect on their hind legs, but if disturbed run to the burrows, carrying the food in their mouths. They destroy considerable areas of range grasses and feed extensively in alfalfa fields and hay meadows in the river valleys throughout their range."

Photograph from U. S. Biological Survey

PRAIRIE DOG AT HOME

Showing the characteristic mound around the entrance to its burrow

THE SEWELLEL FAMILY

(*Aplodontiidæ*)

ON account of certain well-defined peculiarities, the Sewellel, or Showt'l has been placed in a family by itself. It has no close relations in America, but seems to be the sole survivor of an earlier type of rodent. Naturalists now place it between the Porcupines and the Marmots, but it bears quite as many points of difference as of resemblance to either of these families. The Sewellel is a rodent about the size and general build of a Prairie Dog. Its body is short and stout, its limbs are short, its head is broad and triangular. The eyes are small and bright. It is ostensibly a tailless animal, there being only a rudimentary stump. Its claws are long and thumbs short. The skull is massive and broad, and there are no post-orbital processes. The mandible is strong and heavy.

SEWELLEL

Aplodontia rufa (*Rafinesque*)

Other Names.— Showt'l; Mountain Beaver.

General Description.— A stout-bodied, tailless, burrowing rodent, squirrel-like in appearance and about the size of a Prairie Dog. Head very broad and blunt; neck short and thick; ears inconspicuous and nearly hidden in the hair of the head; body stout, thickset, muscular; tail rudimentary, appearing externally only as an elongated tuft of hair; legs short, claws long, fossorial; hair everywhere of moderate length, rather coarse; a shorter underfur present; general color rich brownish or chestnut; lighter below. A little-known animal keeping so closely in its burrow as to be but rarely seen.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{2-2}{1-1}$; Molars, $\frac{3-3}{3-3}=22$.

Pelage.— Adults: Sexes identical. Seasonal variation not noticeably conspicuous. Above, chestnut to reddish-brown, some of the hairs black; beneath, plumbeous, a short underfur showing through the longer hairs; face and ears lighter; hairs of tail like back. Young: Not noticeably different from adults.

Measurements.— Total length, 12 inches; tail vertebrae, 1 inch; hind foot, 2 inches.

Range.— Northwestern Oregon and southern Washington.

Food.— Leaves, ferns and other vegetation.

Remarks.— This little-known animal has no very immediate relationships, being rather a survivor of a primitive type now found only in a very restricted region. It is placed in classification between the Porcupines and the Marmots, but is enough unlike either to warrant being placed in a distinct family. Six species of this queer animal are described, the general variation being in color correlated with a variation in size. In general appearance, however, these different varieties closely resemble one another.

Related Species

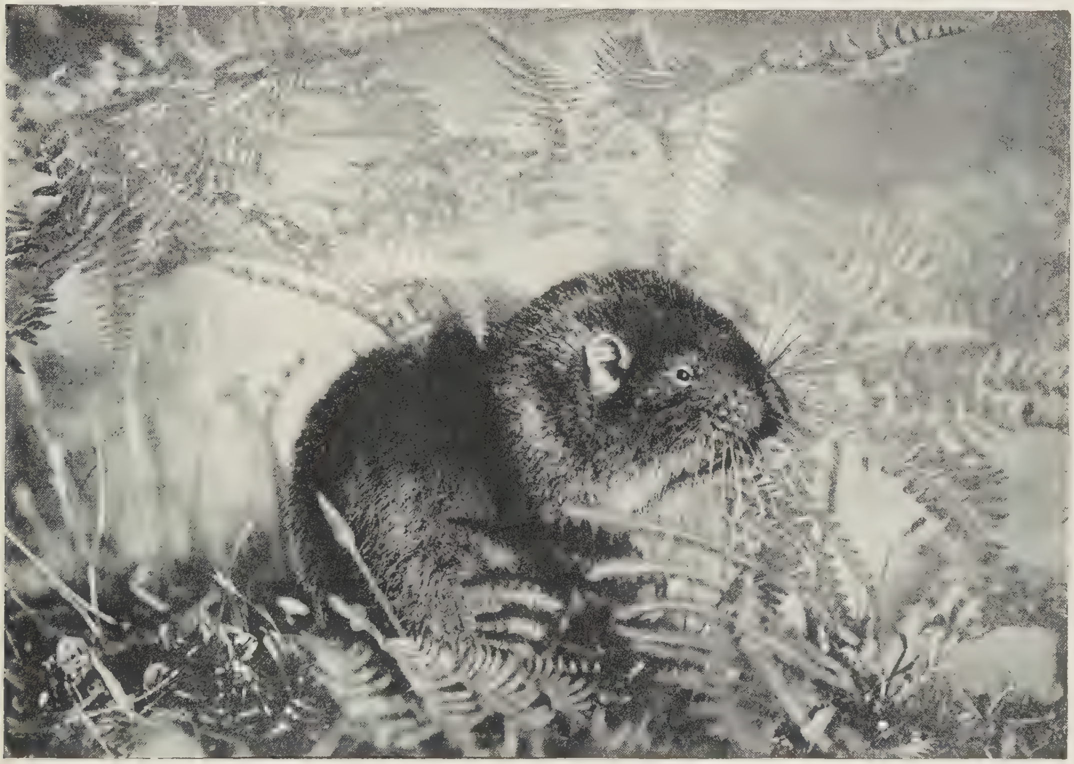
Rafinesque's Showt'l.— *Aplodontia rufa* (Rafinesque). Typical animal as described above. Northwestern Oregon and southwestern Washington.

Pacific Showt'l.—*Aplodontia pacifica* Merriam. Size small, ear longer; colors dark. Coastal region of Oregon about Yaquina Bay.

California Showt'l.—*Aplodontia major major* Merriam. Larger, total length 14 inches; general color grayish sepia brown grizzled with black. Northern California.

Olympic Showt'l.—*Aplodontia olympica* Merriam. Larger and darker than Rafinesque Showt'l. Olympic mountains, Washington.

Among the many new and, to them, strange and interesting animals, discovered by Lewis and Clark in their famous expedition of 1804–5 was a queer-looking tailless animal called by the Indians of the Columbia river, the region where it was first seen, the "Sewellel" or "Showt'l." The white men had seen nothing like it before, and no doubt they may have wondered a bit as to just what kind of an animal it was, although it was set down in literature of that time as a kind of Squirrel. The Indians brought robes made from a number of skins sewed together and the explorers noticed that every skin they saw lacked a tail. Eventually they learned that the animal is tailless. Even today it is a strange mammal to most readers for it is to be found only in a narrow belt along the coast of Northern California, Oregon and Washington and not east of the Cascade Sierra Nevada series of mountains; while in addition it is an animal of retiring habits and apt to escape the notice even of the people about it. Much has yet to be learned of the more intimate details concerning this little beast, which in structure is one of the most primitive types of living mammals. The writer's personal observations appeared recently in a Bulletin of the American Museum, some paragraphs of which are repeated.



Photograph by H. E. Anthony

SEWELLEL, OR SHOWT'L

A peculiar and little-known beast which occupies a family all to itself

The Showt'l in some of its habits and in appearance greatly resembles certain large Pocket Gophers.

If not strictly nocturnal it is at least so much so that the animal can rarely be seen during the day. Although a number of runways were visited and I was daily in places where there were evidences of activity, I saw none of the animals themselves. Those caught in traps were frequently alive when the rounds were made in the morning, and one such individual furnished me most of my points on behavior.

The "colonies" of this animal were found most frequently where vegetation was rankest and where moist loose soil made digging easiest. When such a place is encountered the large holes and piles of earth thrown out from the burrows are generally numerous.

The "colonies," however, are not large. A series of runways is inhabited by a single family, and there is no evidence that this animal is as social in its habits as, for example, the Prairie Dog, or the Meadow Mouse. One might be led to suppose many individuals were present because of the amount of earth thrown out and the numerous runways, but this is easily accounted for by the activity of the Showt'l. Traps set in the runways were almost always successful the first night, one and possibly two animals being caught. Thereafter traps set in the same immediate vicinity yielded nothing for several days at a stretch, probably until some neighbors wandered over from nearby runways.

The burrow workings are simple. The plan is one or more long main runways opening to the surface by short side burrows at frequent intervals. The diameter of these runways is from six to ten inches, depending on the nature of the soil, and the floor is kept quite clear of loose dirt. Generally the runway follows any natural advantage, such as fallen logs, and here often the burrow is so shallow that it is but half its normal diameter into the soil, the log serving to cover it over. Where exit to the surface is made from a deeper runway the course of the short burrow is direct, and often the main runway can be readily seen by looking through its short length. Loose dirt is brought to these burrows and pushed out, being carried just far enough to be out of the way. The main runways, in many cases, may extend for more than 100 feet. The average depth below the surface is eight inches to a foot. The dirt is handled much in the same fashion as the Pocket Gopher works. A mass of loose earth is pushed ahead of the body by the chest and shoulders, the broad blunt head also being used to shove aside the dirt.

Showt'ls when caught in the trap without serious injury are very pugnacious, and at such times when two are brought together fight ferociously. They will bite at sticks or any objects thrust near them, and I imagine that under ordinary circumstances this pugnacity would serve to keep the inhabitants of a series of burrows few in number. Their resemblance to the Pocket Gopher, under similar conditions, indicates that the Showt'l may have the same surly home-life.

An animal caught in a steel trap by the leg but with no bones broken was kept alive to observe his habits. He was aggressive while in the trap and when brought near another captive, also uninjured, after the first tussle he created such a respectful attitude in the other prisoner that the latter strained at the chain to keep out of his reach. They were separated before either had been hurt, for the powerful incisors and strong jaw muscles are capable of giving deep wounds. While in the trap great care in handling the animal had to be exercised.

Before he had been in captivity twenty-four hours he was taken out to be photographed. A wire fastened to a hind leg prevented escape and he was put down in a spot resembling his home surroundings. After several determined efforts at escape, he suddenly stopped his struggles and grabbing a tender young shoot of the " elk brake" by which he was surrounded proceeded to feed as quietly and as unconcernedly as if he were perfectly free. He was quite touchy, however, and any sudden movement brought forth an attempt at freedom. He sat up a great part of the time, and if annoyed while in this attitude sparred like a Bear with his fore paws, showing a perfect control of his position.

So rapidly did he become tame that by nightfall of the first day he took young fern shoots from my hand and ate them while seated upon the window sill of my room, completely oblivious of my presence. His appetite was good and he ate a number of fern tips, generally selecting the youngest and softest from the handful offered him. The elk brake, that seems to be one of his main articles of diet, has many branching stems that bear the green foliage. The Showt'l clipped off an inch or two of the terminal stems, a single snip of the sharp incisors generally severing the small stem. Then holding this stem in his fore paws the animal passed the tender fronds back between the molars, and with a rather hurried crunching munched them down, mastication though rapid seeming to be quite thorough and audible as well. The posture of the animal was squirrel-like, with the back somewhat arched.

He drank large amounts of water when it was given him. He put his nose into the water and drank, and did not lap it up. This Showt'l was liberated on the bank of a small clear brook and as an experiment he was put out into a fairly deep pool. He swam ashore showing no fear whatever of the water, but evidently displaying no particular fondness for it. He looked very much like a slowly swimming tailless Musk-Rat. Despite the fact that the Showt'l has been described as being a water-loving animal, I do not think it ever swims from choice. This one spent some time after coming ashore in shaking out his fur and going over his sides and belly before he felt sufficiently comfortable to begin eating.

This animal washed his face after the manner of small mammals, reaching back with the fore paws onto his shoulders and hinder neck readily, the movements being short, quick dabs. When irritated he twitched the whiskers energetically and when most angry uttered a husky querulous note somewhat like a cough. He often satisfied his curiosity by sniffling and working his nose, and this member seemed to be very sensitive, for the slightest blowing upon it produced spasmodic starts. When aroused his eyes had a bright alert appearance, but quickly took on a dull listlessness when the animal relaxed at ease.

His body was very hard and firm to the touch. When running loose on the floor and I put my hand upon him, he seemed to brace himself and become rigid at times. He could give sharp scratches when held, but did not seem to be able to squirm very effectually because of his short thick neck.

By the end of a week he had become so tame that he never threatened to bite. He seemed to accept the conditions as inevitable and, not showing any appreciation of caresses that some tame animals display, his attitude was one of complete indifference. He soon cut off the toes from the foot that had been pinched in the trap, but evinced no concern over the fact. No attempt was made to gnaw out of the box that kept him prisoner.

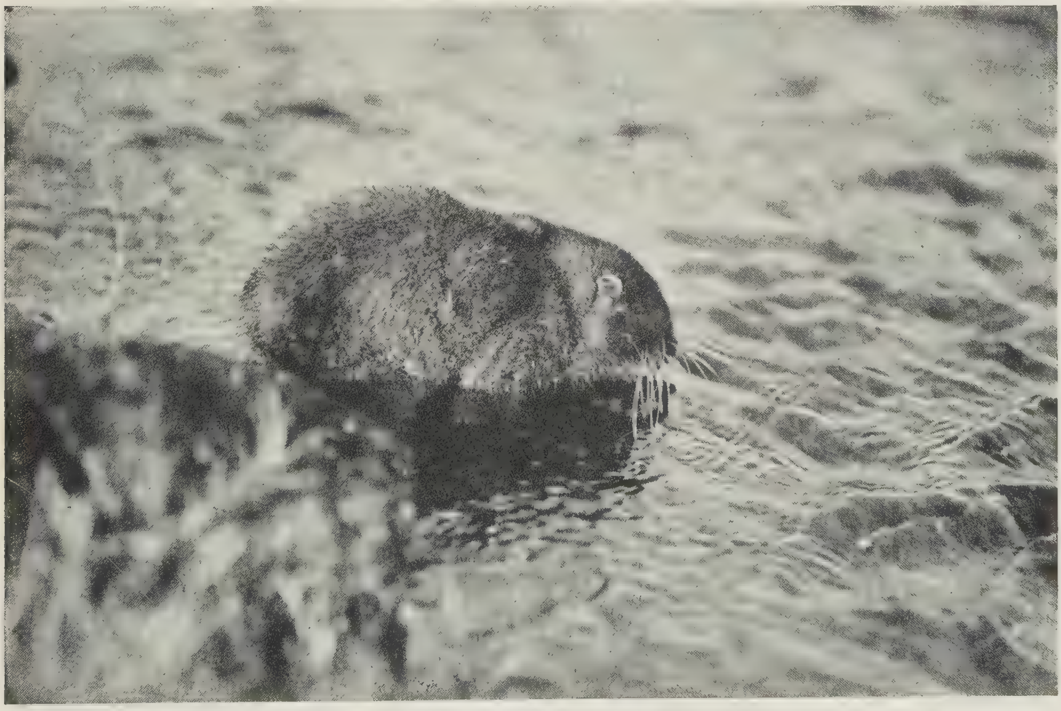
A pronounced musky odor is given off by the animal and is noticeable in skins some months old. It is very noticeable in a freshly killed animal, it having a strong penetrating quality, rather pleasant than otherwise. It recalls, most nearly, the scent of the Musk-Rat.

No very young Showt'ls were noted. This fact would indicate that there is a definite period of birth in the spring, and not an indefinite term extending over most of the early summer.

A variety of plants form the food. All of the more common plants and shrubs seemed to contribute, those noted especially being the thimbleberry, the large elk brake and the sword-fern, but in general any of the green leaved plants might be eaten. Leaves alone are eaten, and there was no evidence that the bark or roots were consumed. I was told by the farmers that the Showt'l not infrequently cuts piles of green vegetation and leaves it outside to cure into hay, taking it into the burrow presumably to store up, a proceeding like that of the Cony.

The Showt'l escapes a great deal of unwelcome attention from such enemies as hawks or owls, owing to the dense vegetation beneath which he works and also to his nocturnal habits. However, prowling animals use his burrows, for two Weasels were caught on successive nights in one runway, and I was told that Skunks were also caught in such runways.

H. E. Anthony.



Photograph by H. E. Anthony

SEWELLEL FEEDING

This animal is sometimes called the "Mountain Beaver", but while not afraid of the water, it does not take to it, as the Beaver does

Photograph by C. Reid

A BEAVER SUNNING

While the Beaver is one of the most industrious of animals, as well as one of the most ingenious, he has his lazy spells like the rest of us

THE BEAVER FAMILY

(*Castoridæ*)

BEAVERS have been placed in a family by themselves, because of certain well-known, distinctive features. Not only are their outward habits peculiar, but their anatomical markings are distinct. Rodents of this type are characterized by a massive skull. There are no postorbial processes. The cheek teeth are rootless, and on each side there are one premolar above and one below. The tail is broad and spatulate, and the hind feet webbed, to assist in swimming. Beavers are aquatic in habit, building their homes in the dams which they themselves have constructed. In this and in other work they display engineering skill of a high order. Economically also they are important. A very valuable trade in Beaver skins was carried on during the early days of this country, which continued until the animals became comparatively scarce.

BEAVER

Castor canadensis (*Kuhl*)

General Description.— Much the largest of American rodents, weighing up to 50 pounds. Head broad and rounded; nose blunt; incisors prominent and of a deep orange color; ears quite short and not projecting much above long hair of head; body very thick set and heavy; tail broad and spatulate, flattened horizontally, and, about one-half length of head and body; legs short; toes five on each foot; hind feet webbed and with claw of second toe double or divided; musk secreting anal glands; general color deep dark chestnut; paler below; pelage composed of dense short underfur and sparser outer fur of longer, harder hairs. Aquatic in habit.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{1-1}{1-1}$; Molars, $\frac{3-3}{3-3}=20$.

Pelage.— ADULTS: Sexes identical. Seasonal variation present but not especially conspicuous. General color brown to blackish-brown; hairs on upper parts dark brown at base, tipped with lighter brown or chestnut; underparts paler than back; sides of neck and rump light cinnamon brown; ears black; tail blackish-brown. YOUNG: Lighter than adults.

Measurements.— Total length about 42 inches; tail 16 inches long by 4.5 inches wide; hind foot, 7 inches.

Range.— From latitude 40° northward to Labrador and Hudson Bay region, and in western portion of range to the Arctic circle west to Cascade Mountains.

Food.— Twigs and bark of many trees, but principally bark of poplar and willow.

Remarks.— This highly specialized animal is placed in a family by itself, generally intermediate between Squirrels and the Rats and Mice. The Beaver may be easily known by its large size and peculiar tail. Variations in color, while not especially conspicuous, together with cranial characters and differences in size have resulted in some seven species and subspecies being formed.

RELATED SPECIES

Canada Beaver.— *Castor canadensis canadensis* Kuhl. Typical animal as described above. Northeastern North America, or northern tree limit, to United States, and west to Cascade Mountains.

Sonora Beaver, or Broad-tailed Beaver.— *Castor canadensis frondator* Mearns. Larger than Canada Beaver. Paler and with broader tail. Southward from Montana and Wyoming to Mexico along wooded streams.

Pacific Beaver.— *Castor canadensis pacificus* Rhoads. Largest of the Beavers. Tail long; color reddish-chestnut. Pacific slope, California to Alaska.

In the days of the early settlement of America the Beaver, including its races, was found from the Atlantic to the Pacific, and from the limit of trees in the far north of Canada to the Gulf of Mexico, wherever conditions were favorable. Today, however, thanks to the unstinted greed of man, this harmless animal has disappeared from the greater part of its former range, and over much of the remainder it is rare.

Within the last twenty years nature lovers and the better class of sportsmen have realized the great loss to the country which would result from the extinction of this valuable animal, and have succeeded in having it protected in many

States. The result is that it has become abundant in certain regions and is common in others. This is notably true in Colorado and Wyoming. In Maine and in the Adirondacks of New York State it is increasing rapidly. In Estes Park, Colorado, it is especially numerous, one holding of 1000 acres having a population of 600 or more.

With proper protection and well enforced laws regulating its capture there is no reason why the Beaver should not become again a source of pleasure and of profit over much of its early range.

Excepting Rats, Mice and Rabbits probably no rodent is so well known. The Beaver's industry has become proverbial; his fur is familiar to all, and his habits have made him a subject of much interesting literature.

The Beaver exceeds all other North American rodents in size. A fairly large one will weigh from thirty-five to forty pounds, and a few will go to fifty or sixty pounds. In shape the Beaver is squat and broad, resembling, in a general way, a Musk-rat, but is at once distinguishable from that animal by its broad tail. Two broad, chisel-like teeth in the front of each jaw enable him to cut wood with great ease and rapidity. These teeth are beveled on the inner surface and are self-sharpening, because the inner softer surface wears away faster than the harder outer surface. The fore-feet have five toes and are used as hands. The hind feet have the same number of toes and are webbed for swimming. In passing through the water the hind legs do the propelling, assisted sometimes by the sculling action of the tail, and the front legs are held against the sides.

The broad tail is not used as a trowel, as was formerly supposed, but is a rudder. Mr. Enos A. Mills states that sometimes mud is transported by being held between the tail, which is turned under and forward, and the under side of the body.

In these days of animal persecution the Beaver is nocturnal, but in localities where he is thoroughly protected he may be seen at almost any time during the day, particularly toward late afternoon. In a lake not far from Yellowstone Park the writer has often seen several Beaver at once swimming about. In Estes Park he has seen them at all hours of the day. One has only to sit quietly beside a Beaver pond to see one or more within a short time.

No mammal approaches the Beaver in the extent or the variety of the structures which it makes. He is the engineer of the mammal world. These works not only involve highly developed instincts, but, some writers believe, indicate a great degree of adaptive intelligence. Certain it is that the Beaver seems to use reason in modifying his structures to meet new situations.

Of all the Beaver's works his dam has at-

By permission of the New York Zoological Society

AN ALERT BEAVER

The engineering feats of the Beavers in building two sets of dams and feeder canals are among the most remarkable achievements of the lower animals tracted the most attention. A fairly narrow valley is selected through which flows a small stream with a slowly moving current. Across this a dam is made of sticks, stones, mud and rubbish. The dam is usually from four to six feet high, eight to sixteen feet broad at the base and a foot or two wide at the top. The length may vary from a few feet to several hundred. The longest observed by the writer is in Estes Park, and is 1040 feet long. Above it and below it are series of shorter dams. These structures are by no means always convex upstream, as some of the older writers assert, but often bend down stream, and the longer ones are frequently zigzag. Secondary dams are often built below the first. These are apparently for the sole purpose of backing up the water against the first dam, and so relieving the pressure — an astonishing proof of the animal's intelligence.

In making the dam mud is used, reinforced by sticks from four to twenty feet long, and from two to six inches in diameter. These are laid approximately parallel to the stream flow, with the larger ends upstream. They are held in place by piling mud and stones on these ends. More sticks are piled above the first and so on until the required height is reached. The mud is taken from in front of the dam and deepens the water at that point. Sometimes simply a barrier of sticks is made through which the water passes freely. In the course of time, however, floating material lodges against the sticks and completes the dam.

As time goes on the sticks decay; more and more mud is added by the Beaver; grass, willows and alders get a strong foothold and we have a solid structure of earth and rocks held firmly together by vegetation. Strong as they are these dams are often broken by flooded streams, but are quickly repaired by the ever watchful builders.

Structures which cost so much work as these must be of much value to the Beaver. Two purposes are fulfilled. Usually the dam forms a pond deep enough so that the openings into the Beaver houses, or into burrows in the bank, are far enough under water to protect their owners against enemies. The center of the pond provides a storage place for the large supply of green sticks collected for the winter food. A third use is to extend a body of water toward a group of trees which the animals are to cut and float to their homes.

Photograph by C. Reid

BEAVER SWIMMING

As has been indicated, Beavers live in houses or in holes in the banks of ponds. The houses are made of much the same materials as the dams, and are of various sizes according to the number of individuals living in them. They are conical, and may be eight feet high by forty feet in circumference. Inside, and just above the water level, is a large chamber which is connected with the outside by a tunnel opening under water. The chamber walls are about one foot thick and, when frozen solid, defy the attack of the Beaver's fiercest enemy, be it Bear or Wolverine.

When the home is a burrow, the opening is under water and a tunnel extends diagonally for several feet, sometimes thirty, into the bank, and ends in a chamber three or more feet in diameter and about one foot high.

In summer Beavers travel away from home to a considerable distance, visiting other colonies and exploring other streams, and the houses are used less and the burrows more. When harassed they are less likely to make houses.

Of all the works which show the skill of the Beaver, many regard his canals as showing his intelligence to the fullest extent. Many animals build homes, and the dam has a direct connection with the safety of the Beaver home, but the canal has no direct connection with either. It is a structure planned with a definite end in view, that is, the greater ease in transporting food. When all suitable trees near the borders of the pond have been cut, it becomes increasingly difficult to get sticks from the source of supply to the storage pile in the home pond. At the expenditure of much energy the stick must be rolled, pushed and dragged for a distance, in some cases, of a quarter of a mile or more. To avoid this, when the ground is suitable, a colony of Beavers will often dig a canal in the direction of a grove of trees. According to circumstances such a canal may be from a few feet to several hundred in length. Its depth varies from about fourteen inches to over three feet, and its width is two feet or slightly more. Beavers will on occasion dam the canals and also construct lateral ridges to direct surface water. This further evidence of engineering skill would be astonishing were it the only trait of this extraordinary animal.

Canals are sometimes dug in the bottoms of shallow ponds. These make travel and transportation easier in times of low water, and afford avenues of travel when the ponds are frozen nearly or quite to their bottoms.

The food of Beaver has been indicated already. It is the bark of many kinds of deciduous trees, especially aspen, willow and birch. Roots of water-lilies, grasses and even berries are also eaten, but bark is the staple. Evergreen trees are sometimes cut for structural purposes, but the bark is not eaten.

Since the Beaver cannot climb, he must fell trees in order to get any large supply of food without traveling to great distances. This he does by gnawing, for which his four great chisel-shaped front teeth are well adapted. A tree two to eight inches in diameter is usually selected. The worker sits bolt upright with his tail stretched out behind, as a prop, and proceeds to cut in such a manner that, just before the tree falls, the cutting resembles the central part of an hour-glass. When once seen it can never be mistaken. As the tree is about to fall the Beaver woodchopper slaps the ground with his tail as a warning to others, and all get to places of safety. The branches are trimmed off next, the trunk cut into lengths of from three to six feet or more, and are dragged and rolled to the pond or canal through which they are floated to the food pile near the house. Here they are sunk to the bottom and held there by a little mud and by other pieces piled on top. The diameter of the trees cut usually is not over eight inches, and the record is thirty inches, but the writer has seen three narrow-leafed cottonwood trees in one group, varying from twelve to fourteen inches in diameter, all of which had been felled. Only branches less than eight inches in diameter, however, had been used.

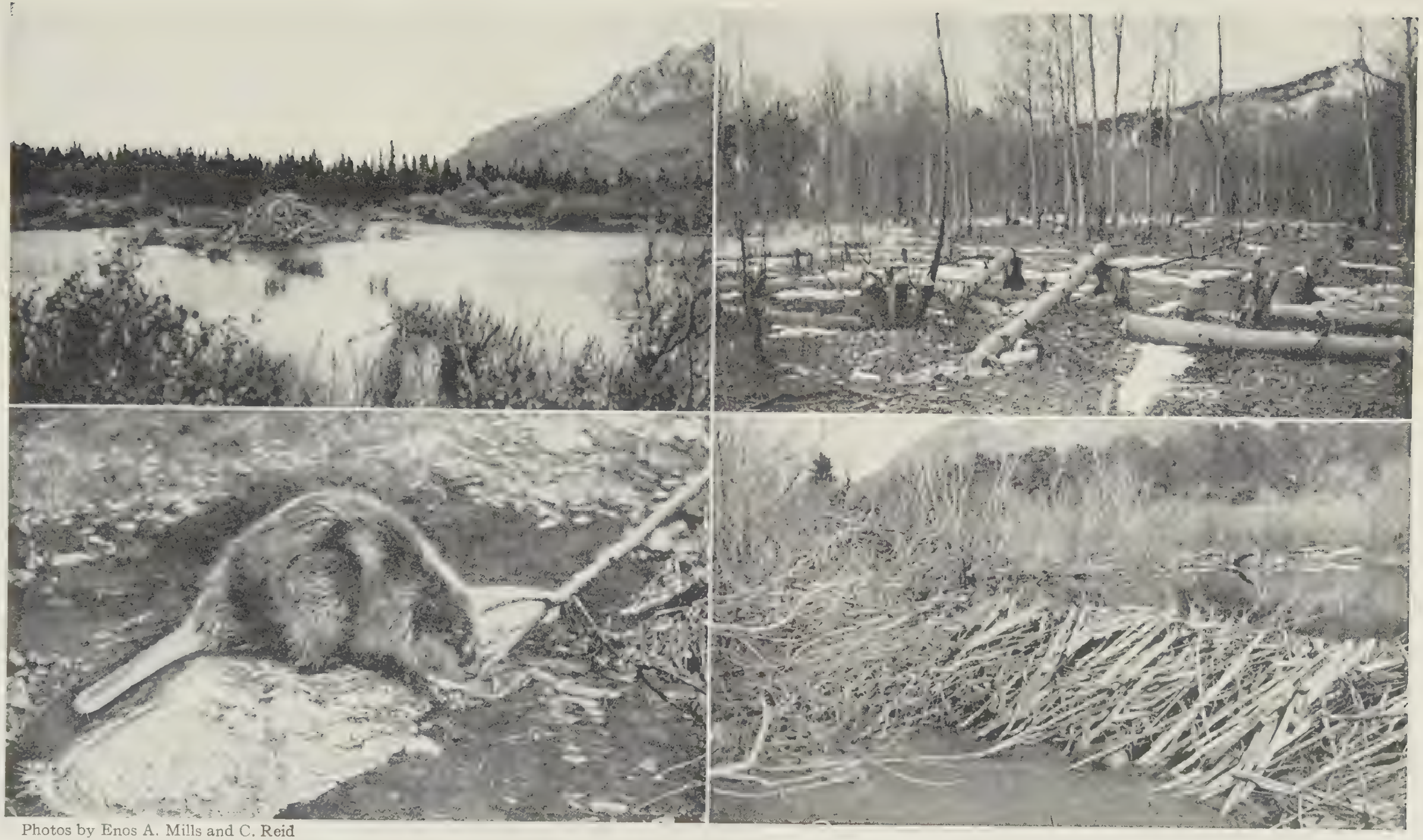
The Beaver, contrary to common report, does not always succeed in making a tree fall in a given direction. Many pictures are extant showing trees in helter-skelter position.

After the bark has been eaten during the winter the sticks are used for house and dam building, if needed.

Beavers are monogamists and, apparently, mate for life. Mating takes place in February, and the young are born in May. In a month they can live on solid food, and at two years of age are capable of mating. The number of young in a litter averages about four, but it may be any number from one to eight.

The following pleasing glimpse of the Beaver at home is given by Dan. J. Singer: "As we were passing a small pond of perhaps 100 yards in diameter, I caught a transient glimpse of a Beaver through the thin blue ice as he darted into the tunnel which led to his house. This low-domed house (which looked very much like the house our musk-squash builds) was built of mud, turf and sticks cleverly interwoven, and rising about three or four feet above the surface of the ice. At one end of the pond they had their customary dam, as well as a great store of food to guard against the winter's famine. At a point in the dam they had deposited this food supply, which consisted chiefly of willow branches cut into convenient lengths. At feeding time one slips out of the house and swims down through the pale amber water to the brush-pile, selects a suitable stick and returns to dine on its tender bark. And so, all through the long, savage winter, the little chaps live, play and feed — all below the frozen upper world.

"The Beavers are not without their enemies, however, and, perhaps, the most feared is that long, squat, shambling animal, with a triangular head and two cruel leering eyes — the Wolverine or Glutton. With just about six rakes of his rascally claws he could demolish the entire house, once the ice has ceased to protect it, but presto!



Photos by Enos A. Mills and C. Reid

THE BUSY BEAVER AND HIS WORKS

The photographs are of a beaver house (upper left); trees felled by beaver (upper right); a beaver dam (lower right); and one of these clever rodents (lower left) the little chaps, whisking out into the friendly water, are not to be caught by such a trick.

"Then there were those gray, drifting shadows that lurked near the pond when the little chaps were busy in the spring repairing the dam — those round-eyed, moon-faced Lynxes, gaunt with famine after the scourge of winter, which come stealing on soft-padded feet and bellies to the snow, just within springing distance. The wary sentinel Beaver brings down his wide, flat tail on the water with a loud smack — a signal to every Beaver to vanish."

In many parts of the West there has been bitter opposition to the conservation of the Beaver because of the damage it does to fruit trees. By making extensive ponds, also, the Beaver sometimes kills a great quantity of very valuable timber. In Ontario several years ago this backing-up water by the Beaver and the killing of valuable timber became such a serious matter that the province authorized the destruction of several hundred of the animals.

However, the Beaver is constantly proving that his good deeds outweigh the bad. In the arid plains irrigation plays a very important part. A constant supply of water is necessary for this. The Beavers in the mountains, by building a series of dams in the valleys, form ponds and willow-covered marshes, which retain the extra waters of the melting snows and spring rains, and give it out gradually during the summer.

Beavers should be allowed to exist simply for the interest they add to the life of mankind, to say nothing of their economic value. Beaver skin has brought more money than that of any other animal, unless it be the Fur Seal. So common was its fur in early days, and such a standard value did it have, that in Canada for many decades it was a medium of exchange among the Indians, white trappers and traders. In the latter part of the eighteenth century American companies exported about 150,000 skins annually and the Hudson Bay Company 50,000 more. The fortune of the Astor family had as its basis chiefly the trade in Beaver fur. This interesting fact is tacitly implied in the image of the Beaver which appears in the tile work of the Subway station at Astor Place, New York.

J. M. Johnson.

WESTERN, OR YELLOW-HAIRED PORCUPINE

THE PORCUPINE FAMILY

(*Erethizontiidæ*)

THE Porcupines belong to a separate family from the other North American Rodents — their outward dress alone serving to distinguish them from other animals, were there no other marks. They are thick-set Rodents, having long sharp spines loosely attached to the skin. The skull has a short blunt facial portion. The molars are more or less completely rooted.

The short thick tail, short legs, and plantigrade feet are also characteristic of our native species, although foreign types differ, one kind in South America having a long tail for clinging, like our Opossum. The spines barbed at the tip are scattered among the hair, pointing backward, but may be elevated by muscular contraction. They are so loosely set that they readily stick to other objects, but the animal has no power to discharge them. The Porcupine family in North America falls into two fairly well-marked groups.

CANADA PORCUPINE

Erethizon dorsatum (*Linnaeus*)

Other Name.— Quill Pig.

General Description.— A very large rodent with thick-set body and pelage containing numerous sharp barbed spines, exceeded in size among American rodents only by the Beaver. Head blunt and rounded; facial region short; ears of moderate height; body very stout and thickset; tail about one-fifth length of head and body, thick and muscular; legs short; four toes on fore feet, five on hind feet; lips hairy; pelage composed of three elements, a short, fairly soft underfur, very long coarse hair forming the outer fur, and numerous stout spines set loosely in skin and barbed at tips. These spines have lost all resemblance to hairs. Coloration dark.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{1-1}{1-1}$; Molars, $\frac{3-3}{3-3}=20$.

Pelage.— ADULTS: Sexes identical. No marked seasonal variation. General coloration blackish; long hairs of dorsal surface yellowish-white at tip; quills white with dark tips, ordinarily fairly well concealed by the long hairs; underfur blackish-slate; quills longest on lower back and tail; quills not found on under surface; below brownish-black; tail colored like back. YOUNG: Similar to adults, spines shorter, and light tips to hairs not so conspicuous.

Measurements.— Total length, 35 inches; tail, 5.5 to 6.5 inches; hind foot, 3.5 inches. Weight, 30 pounds.

Range.— From 40° north latitude in eastern North America to Hudson Bay, northwest to Arctic circle and Alaska.

Food.— Chiefly bark and twigs of willow, hemlock and other trees. Decided craving shown for salt.

Remarks.— There are six varieties in North America falling into two fairly well-marked groups differing mainly in coloration; those of the Canadian Porcupine group being yellowish-white, those of the Yellow-haired Porcupine group being a greenish-yellow.

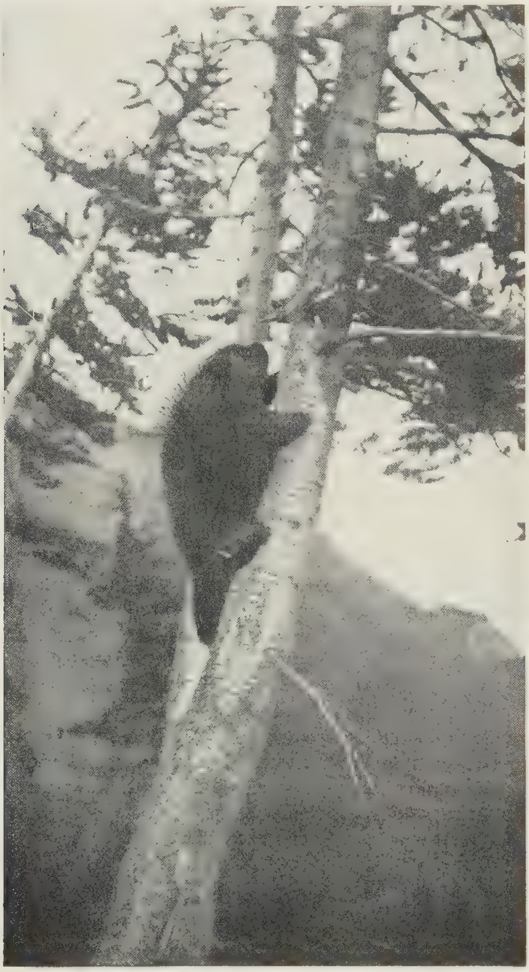
RELATED SPECIES

Canada Porcupine.—*Erethizon dorsatum dorsatum* (Linnaeus). Typical animal as described above. From 40° north latitude in eastern North America to Hudson Bay northwest to Arctic circle and Alaska.

Yellow-haired Porcupine, or Western Porcupine.—*Erethizon epixanthum epixanthum* Brandt. Similar to Canada Porcupine, but long hairs with greenish-yellow tips, and quills yellowish with black tips. From upper Missouri south to New Mexico, west to the Pacific, northward from California to Alaska, probably the limit of trees.

Anyone who has traveled in the woods of the northern United States is familiar with the Porcupine, or Quill Pig. In appearance he is not attractive. His shape is not unlike that of a Beaver covered with long stiff quills. His tail, too, is broad and flat, but not so wide as that of a Beaver. This also is quill covered. The dull expression of his eyes is indicative of a thoroughly stupid animal.

As in the case of so many animals, the Porcupine is more common in some localities now than it was some years ago. In the Adirondacks when deer were formerly hunted with hounds the latter would often attack a Porcupine. A mouthful of quills and a dog rendered useless for a long time was the result. The hunters swore vengeance on the cause of their troubles, and shot every Quill Pig they saw. In Canada the Indians also decreased their numbers by killing them for food. Now all is changed. A law protects them in Canada, and hounding deer is not allowed in most parts of the United States. The hunters also fear to frighten the deer by shooting at other animals, and thus the Porcupine escapes.



PORCUPINE CLIMBING

The Porcupine never hurries, whether on the ground or up a tree

Although found in deciduous and in mixed forests, the Porcupine prefers the evergreen woods. The hemlock is his favorite food tree, and, in winter, he subsists almost entirely upon the bark of this and other trees. In summer, however, he will eat almost any vegetable matter, and will go to considerable trouble to get lilypads.

In one respect, however, the Porcupine is not a strict vegetarian. He will brave all dangers to get salt, or anything that has the suggestion of a salty flavor. Repeatedly during the night he will return to a camp from which he has been driven, in order to gnaw flooring, door jams, axhandles, or any article which has been handled.

Some years ago the writer, with a party of four or five persons, was traveling in the Adirondacks when he chanced upon a deserted camp composed of several tents made of canvas stretched over wooden frames. On entering one of these, three Porcupines attempted to pass out. They were driven back with sticks, but repeatedly tried to get past the door-keepers. Finally one of them climbed a diagonal support, over which the canvas was stretched, in order to reach the ridge-pole. The canvas, however, hindered him, and he soon fell, landing in a nail-keg. This incident suggested a method of capturing them all alive without injury from the quills. Several large grain sacks, filled with hay, were lying about. They had served as pillows. One of these was emptied and a member of the party held it open under the diagonal support. Then some of us drove a Porcupine up the support until the canvas prevented further progress, when the animal fell into the open mouth of the grain sack. This was repeated until all three were captured.

This incident illustrates two traits of the Porcupine. First, it will go directly toward an enemy, if it must, in order to reach a familiar place of refuge. Second, the fact that flooring, tent supports, broom-handles, and other things, with which human flesh had come in contact, were much gnawed showed its taste for salt.

Except during the coldest weather, the Porcupine does not hibernate. He may stay in his "den" until the worst is over, but a slight increase in temperature will bring him out, and his wanderings may be traced by his tracks in the snow and by chips and pieces of bark under the trees where he has fed. Nor does he confine himself to the night hours for roaming, but may be seen at all hours of the day. Once he has gotten into a favorite tree, he is not likely to leave it until he has exhausted its food possibilities.

Although a Porcupine will retreat when it can, it will often sit still, if its place of refuge is too far away. When attacked it does not roll itself into a ball, as has often been stated. It does, however, arch the back, erect the quills, put the head under a log or root, if one happens to be handy; otherwise it puts its nose between its forepaws. Then if approached closely, or poked with a stick, it waves its tail defiantly. Woe betide the animal which is rash enough to get in the way of that tail. Wherever it strikes flesh the quills penetrate, stick, and cause great pain. More pain will come later when an attempt is made to pull the quills out. The point is very sharp, and below it are hundreds of little barbs pointing backward. This means that they must often be cut out of the flesh or the points broken off in it. In the latter case these points often "work through" the part injured. The quills separate easily from the skin of their owner, but he *cannot throw them* at an enemy as was formerly stated.

Panthers, lynx, bears, foxes, wolves, and other flesh-eaters fall victims in their attempts to make a meal of this armored rodent. The mouth and throat of these victims become so sore and swollen from the quills that the animal cannot eat, and soon perishes. The Fisher is believed to be the only enemy that has solved the problem of safe attacks. It kills the Porcupine by quickly turning it over, and slitting its abdomen.

Since the Porcupine does not have to depend upon flight, alertness, subterfuge or fight to escape its enemies, but only upon a protective covering, its mental qualities are not high. Indeed it is one of the dullest animals. Use is the mother of progressive development, and disuse leads to degeneration. This law is well illustrated also in the turtle, armadillo and echidna.

YELLOW-HAIRED PORCUPINE

This western type has a wide range, having been found above the timber-line on some Colorado mountains

Mating in the northeastern United States takes place in the autumn, and the young are born about the first of May. Merriam states that they are actually larger, and relatively thirty times larger, than the young of the Black Bear. From one to four is the number in a litter. By autumn they are able to shift for themselves.

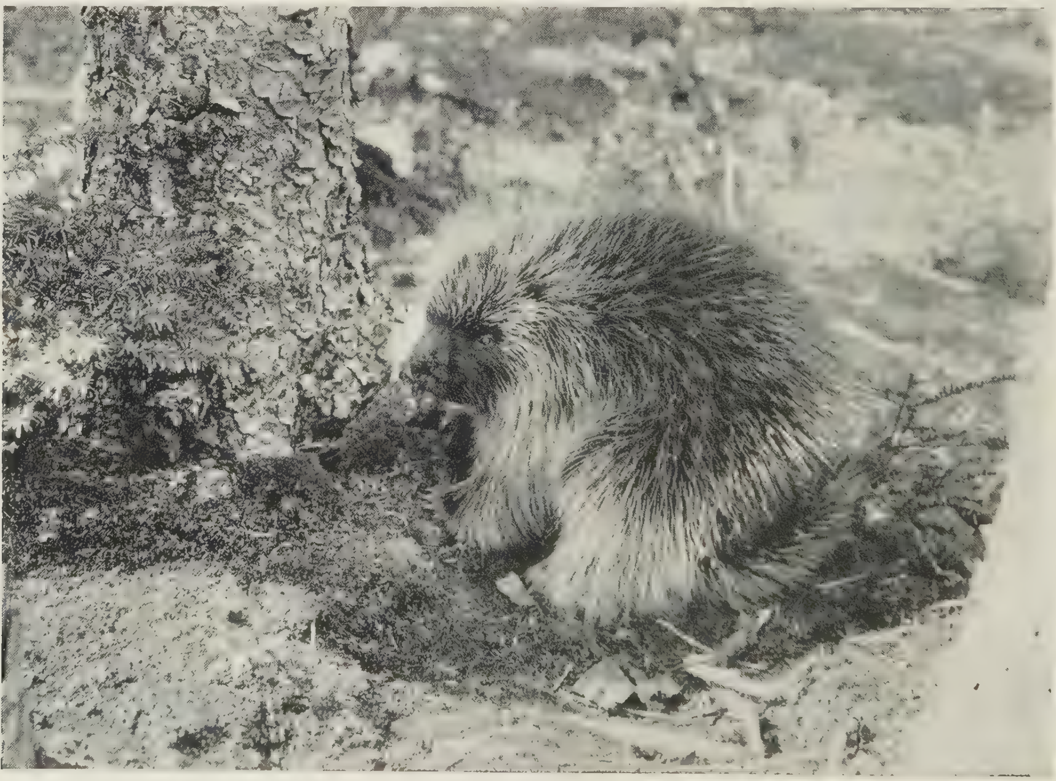
The *Yellow-haired,* or *Western, Porcupine* is so much like the eastern one in general appearance that a casual observer would not see any difference. He has the same spiny covering, the same stupid eyes, and the same indifferent attitude toward his enemies. The chief difference is in color, the western type being of a greenish-yellow hue.

The range of altitude of this western cousin is remarkable. The writer has seen a dead Porcupine in the sagebrush desert of the Wind river valley in Wyoming at an altitude of 6000 feet, and a live one above tree line, 12,400 feet, on the top of Flattop Mountain in Colorado. It was a great surprise to see him ambling along on this wind-swept, cold, boggy surface. His food must have been the bog willows which were only a few inches high and widely scattered. Perhaps he had only strayed for a few hours to the point where he was seen. Groves of jack-pine and other conifers grew several hundred feet below, and in these he must have had his home.

Another specimen was found at an altitude of 8500 feet, in Estes Park. He was in a wood road, and hurried toward a wall under the tree beside the road. We wanted a photograph, and grabbing long sticks, ran to him and, by dint of much prodding and shoving, managed to keep him out of the deep shade long enough to get two good exposures. His constant endeavor was to get his head under something, but never once did he try to curl into a ball.

The remains of a Porcupine in the Wind river valley were discovered in a curious and laughable way. A member of the party with whom the writer was traveling on horseback through western Wyoming, leaned over, cowboy fashion, to pick up a handkerchief from the ground without dismounting. A loose saddle-cinch allowed the saddle to turn, and the rider suddenly found himself on the ground, sitting squarely upon the skin of a dead Porcupine. Although the animal was dead, the quills were just as much alive and full of vim as ever. When the rest of the party rode up, the unfortunate man was busily engaged in pulling out the quills, meanwhile expressing a pointed opinion about all Porcupines in general and this one in particular.

The Indians value the Porcupine as food and as a source of the quills which the women use for various kinds of fancy work. The white man, however, has made little use of this peculiar animal. It has, however, saved the life of more than one hungry man lost in the wilds, as it is the only edible animal that can easily be killed without firearms. J. M. Johnson.



YELLOW-HAIRED PORCUPINE

A western species, photographed in Estes Park, Colorado

THE FAMILY OF RATS AND MICE

(*Muridæ*)

THIS is the largest of all families among the mammals. It numbers a wide variety of individuals. They are generally very small rodents with lower incisors compressed; no premolars; molars rooted or rootless; and tail generally nearly naked and scaly.

Dr. Coues described the members of this family as " a feeble folk, comparatively insignificant in size and strength, holding their own in legions against a host of natural enemies, rapacious beasts and birds."

Few of us have any idea of the large number of these little beasts. They are found almost all over the world, far outranking other forms in number. In North America nearly one-fourth of all our four-footed animals belong to this mighty family. There is, in fact, no escaping them. They invade our pantries, our barns, our fields, our plains, and our woodlands. There are special types adapted to nearly every environment, as for example the Wharf and Sea-going Rats.

The family is therefore of great economic importance to man; and its members — some of them at least — may be fittingly described as the greatest travelers among mammals. Probably not a ship enters or leaves our ports that does not have among its unlisted passengers some enterprising Rat or Mouse. Dr. Rae some years ago captured at York Factory, on Hudson Bay, a specimen of the Common House Mouse which had been brought from Europe; and the Brown Rat has been seen on liners between San Francisco and Honolulu.

In size the numerous species comprising the family range from the Musk-rat to the pygmy Harvest Mouse. Every country has its own particular species, and North America has many that are native. The fecundity of Rats is astonishing. In the temperate parts of the United States, Rats breed three to five times a year; the Meadow Mouse brings forth four to six litters. That Rats are the disseminators of disease has been established beyond question. Not only do they convey the bubonic plague, but they are known to spread trichinosis among swine. As they move about in all sorts of filth, it is obvious that they must be active agents in the propagation of the germs of many other diseases. The Brown Rat, the Roof Rat, and the Black Rat are, however, all " introduced " Rats. The native American Rats are of a totally different character. Rats like the Wood Rat are not only clean in themselves, but their food is of an unobjectionable nature; and, as will be shown later, their flesh is both wholesome and palatable.

In habits Rats and Mice are for the most part nocturnal. Many species live in burrows or tunnel-like runways on the surface of the ground among the grass roots and seldom venture forth into the light. Other species like the Musk-rat are aquatic and have become excellent swimmers. While this family is popularly known as Rats and Mice, the two names refer to the same type of animal, the distinction being chiefly one of size. As the sizes approach each other, there is some confusion of terms, which is further heightened by the use of such terms as Lemming, Lemming Mouse, and Vole. However, by dividing the present numerous family into fairly well-defined groups, we shall be aided in our study of this industrious and ubiquitous rodent.

HOUSE RAT

Epimys norvegicus (*Erxleben*)

Other Names.— Norway Rat, Brown Rat, Gray Rat, Barn Rat, Wharf Rat.

General Description.— The common Rat to be seen about cities. Head of normal size; nose pointed; muzzle naked at extremity; ears and eyes rather large; body moderately large; tail long, about half of total length, nearly naked, with rings of overlapping scales; legs of normal proportions; hind foot with six tubercles on the naked sole; no cheek pouches; fur rather coarse than soft.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{0-0}{0-0}$; Molars, $\frac{3-3}{3-3}=16$.

Pelage.— ADULTS: Sexes identical, seasonal variation slight. Normal coloration grayish-brown above; dirty grayish-white below; upper surface with more or less black hairs especially along the dorsal area; feet soiled grayish-white; tail dusky above and rather lighter below, though not distinctly bicolor. Hair on tail short and so sparse that the annuli may be plainly seen. YOUNG: Grayer than adults.

Measurements.— Total length, 15.7 inches; tail vertebrae, 7.5 inches; hind foot, 1.6 inches.

Range.— Practically cosmopolitan. In North America found in nearly all cities and the larger settlements.

Food.— Omnivorous to a large extent.

RELATED SPECIES

Norway Rat.— *Epimys norvegicus* (Erxleben). Typical animal as described above. North America about the habitations of man.

Black Rat.— *Epimys rattus rattus* (Linnaeus). Size smaller than Norway Rat; tail longer, more than half the total length; color above plumbeous-black, below slate-black. Found only in scattered localities, mainly in the southern and southwestern United States.

Roof Rat, or Alexandria Rat.— *Epimys rattus alexandrinus* (Geoffroy). Smaller than Norway Rat, about size of Black Rat; tail very long, more than half total length; color reddish-brown above, yellowish-white to whitish below. Found in scattered localities.

Photograph by West Va. University Experiment Station

HOUSE RATS IN TRAP

The Rat will fight viciously when cornered, and has been known to put the cat to flight

The common Rat is an "introduced" guest, as its other name "Norway" indicates, and has somewhat overstayed its welcome. It was brought over to America in some of the earliest ships, and thus may trace its lineage not only to the Mayflower, but perhaps even further to the voyages of the Norsemen. Evidence shows that it reached our shores both by way of the Atlantic and the Pacific.

There are three related species that have been thus introduced. One of the first to come was the Black Rat and also at an early time, the Roof Rat. However, with the advent of the Norway Rat, both the others were driven out, and today are found only in out-of-the-way places not yet settled by the Norway Rat.

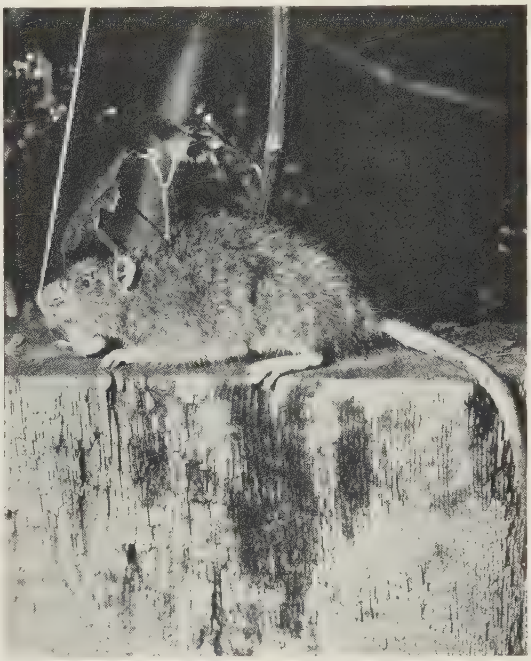
These introduced Rats may be readily told from our native Rats by their general appearance, such as the scaly, ringed tail and the coloration above described.

The Norway Rat is perhaps the most detested of all mammals. It is a born thief; it feeds on nearly every kind of vegetable or animal food. It will kill poultry and devour eggs; it will ravage grain fields and carry off to its hole grain, potatoes, vegetables and similar spoil. Its powerful teeth enable it to gnaw through stout boards and partitions in a very short time. The writer has seen a lead pipe that was gnawed through by these Rats, causing an escape of gas which led to a serious explosion.

The peculiarity of this Rat is that it is destructive everywhere. In the fields it digs the seed as soon as it is sown; it eats the green growing grain; and when the crop is harvested it follows it into the stack, the granary, the warehouse, and the mill. In the greenhouse it attacks the bulbs, stems, leaves, and seeds of flowers; it will climb blackberry canes and grape-vines to obtain the fruit; and in imperfectly protected hen houses it will take both eggs and young chicks from under sitting hens. That many of these depredations are not prompted by need of food is evident.

In this connection an experience of the present writer may be of interest. On the occasion of moving into a house in Montclair, New Jersey, toward the end of April, a few years ago, the furniture vans, coming from a distance, did not arrive in time for the books to be placed on the library shelves. The books were therefore placed for the night on the floor of an empty upper room. In the morning it was found that during the night a Rat, or Rats, had entered the room and attacked a number of volumes which had leather backs. No books with bindings other than leather were touched. Now the weather was mild and spring-like, and there was nothing to suggest that food was scarce. Why did the Rat attack these particular books? It should be mentioned that the meal apparently was too much for the intruding rodent, for during a long occupancy of the house it was never heard or seen again. Also, in justice to the authors we shall not mention the titles of the volumes!

Ernest Ingersoll states that Rats "often gnaw the hoofs of horses until the feet bleed. They have been known to kill young lambs and pigs, and to attack very fat hogs and eat holes in their bodies, causing death. Farrowing sows have been killed by Rats gnawing their teats until blood poisoning resulted." A prominent American broker bears today the mark where a Rat bit him on the nose when he was an infant and asleep. Since the introduction of lighting by electricity, there have been numbers of fires caused by Rats gnawing the insulation.



Photograph by H. T. Middleton

AN UNWILLING POSE

A flashlight, in which the Rat itself may be seen pulling the trigger

The Brown Rat is very prolific. It begins to breed when very young, has several litters a year, and produces eight to fourteen young at a birth.

Extremes of temperature do not seem to bother this rodent. Mr. Wilfred H. Osgood in his "Natural History of the Cook Inlet Region, Alaska," states that "a few Norway Rats have established themselves about the wharf and stores at Sunrise.”

The *Black Rat* seems to have been the first of the foreign Rats to take up its abode among us. Of Oriental origin, it made its way into Europe and was thence conveyed to Spanish America, probably in the sixteenth century. It spread northward; but with the introduction of the Norway Rat, the black species was gradually driven out by its more savage relative. It is still numerous in the West Indies and in Central and South America. This species does not burrow under foundations as the Brown Rat does. It breeds three or four times a year, and there are usually five or six young in a litter. The tame White Rats which children keep as pets are a variant of this species.

By permission of U. S. Biographical Survey

BLACK RAT

A sketch showing the powerful neck and head, and other distinguishing marks of this unwelcome immigrant

The *Roof Rat* originally came from Alexandria, Egypt, or the neighboring countries. It resembles the Brown Rat, but is grayer in the upper parts, and its abdomen and feet are of a yellowish-white. Like the Brown Rat it is a wharf Rat, and is moreover a very good climber. It is found on ships, and has obtained a footing in some of the southern States. Two specimens were caught on the Guadalupe river, at Ingram, Texas, in 1902, whose presence in a place so far in the interior is thus explained by Bailey: “The Guadalupe river is subject to violent floods, sometimes rising suddenly to fifty feet above low water. The enormous heaps of drift rubbish deposited along the bottom and in the branches of trees have evidently furnished a highway for the distribution of the Rats from the coast up the river. The two individuals secured were living in these drift heaps. One was caught on the ground at the edge of a drift heap; the other, on a pole reaching across from one heap to another.”

Albert Porter.

EASTERN WOOD RAT

Neotoma floridana (*Ord*)

Other Names.— Pack Rat, Trade Rat, Brush Rat.

General Description.— About the size of the House Rat but with a more hairy tail. Head pointed; eyes and ears large; ears thinly haired; whiskers very long; body only moderately thick set; tail long, about half of total length, well clothed with short hair; legs fairly long, slender; general color above plumbeous, below white; hair rather long. Of nocturnal habit but often seen in the daytime as well; of inquisitive temperament.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{0-0}{0-0}$; Molars, $\frac{3-3}{3-3}=16$.

Pelage.— Adults: Sexes identical. Seasonal variation slight. Above, plumbeous or slaty-black, darkest on dorsal region, mixed with dark-brown and pale yellowish-brown, the latter predominating on flanks; feet and underparts clear white; tail above dusky, below white, sharply bicolor; tail well haired but not bushy. YOUNG: Slate gray above, white below; tail not so well haired.

Measurements.— Total length, 15.5 inches; tail vertebrae, 7.5 inches; hind feet, a trifle over 1 inch.

Range.— South Atlantic and Gulf Coast and lower Mississippi Valley.

Food.— A large variety of seeds, grains, leaves of different plants, and other vegetable matter.

Remarks.— Thirty-four species and subspecies of Wood Rats are found north of the Rio Grande, most of them belonging to the round-tailed or narrow-tailed section of the genus.

RELATED SPECIES

Eastern Wood Rat, or Eastern Pack Rat.— *Neotoma floridana floridana* (Ord). Typical animal as described above. Atlantic Coast region from South Carolina to Florida.

Pennsylvania Wood Rat.— *Neotoma pennsylvanica* Stone. Tail less than head and body; ears moderately large. Southern New York to northern Alabama, westward to Kentucky and Tennessee.

Small-footed Wood Rat.— *Neotoma micropus micropus* Baird. Southeastern Colorado and southern Kansas south through Oklahoma and central Texas.

Dusky-footed Brush Rat.— *Neotoma fuscipes fuscipes* Baird. Size large; tail long; ears large; upper surface of hind feet dusky; ankles blackish. Pacific Coast region from San Francisco Bay north to Salem, Oregon.

Desert Brush Rat.— *Neotoma desertorum* Merriam. Pelage very soft; tail short, brownish buff above with mixture of black hairs. California, Nevada, Oregon, Utah, Colorado in desert areas.

White-throated Brush Rat.— *Neotoma albigula albigula* Hartley. A large dark form; grayish-yellow brown above, thickly lined with black. Northern New Mexico, central Texas, western Arizona.

Brushy-tailed Wood Rat.— *Neotoma cinerea cinerea* (Ord). See special synopsis below.

The group of Wood Rats, *Neotoma,* is a very large one and in general is distributed over nearly all of North America. The Wood Rat may be easily recognized by the clear white underparts contrasting noticeably with the slaty upper parts, as well as by the long densely haired tail, these characters being sufficient to separate it at a glance from the Norway Rat, the only rodent with which it could be confused.

Being a rather adaptive group Wood Rats are found living not only in timbered areas but on the desert as well, and thus, as might be expected, some variation in coloration is encountered. In addition a somewhat distinct subgroup or subgenus of these Rats having tails decidedly more bushy is found in western North America.

The Wood Rats are in many respects the most interesting of all; and some of them are really handsome animals. They are not to be associated with the common Brown or Wharf Rat. When the word "rat" is mentioned, most persons at once think of those filthy stable-haunters and plague-conveyors introduced from the Old World. Wood Rats, however, are of a different genus, indigenous to America, and are clean, velvety-furred animals of exemplary habits. They have even been declared to be good eating. Mr. Vernon Bailey relates that when he was gathering specimens in Missouri, three or four of those collected were cooked at the ranch where he was staying and were pronounced "better than Gray Squirrels. The meat was very tender and of good flavor, with no trace of the external musky odor peculiar to Wood Rats."

Some Wood Rats live in woods and swamps; some are to be found, as in Nebraska, from the bases to the tops of mountain ridges; some make their home in rock ledges or broken cliffs. The *White-throated Wood Rat* is a cliff-dweller, always keeping to the rocks.

A characteristic of all the species is the house which they construct. In the selection of a site some of these animals show considerable intelligence. The Baird *Small-footed Wood Rat,* for instance, has its favorite building site "in and around a bunch of the blades of the prickly pear, where the stack of rubbish — cow-chips, sticks, bark, leaves, stones, bones, pieces of metal, dishes, leather, rags, or any other available material, well salted with bits of cactus and other thorny things — is often built into a dome four or five feet high." Most of these houses are so well protected with thorns that they are rarely molested, even by the tough-hided Badger. But "how Rats themselves can run over these houses and along the trails strewn with cactus spines and never show a scratch on the bare pink and white soles of their feet is a mystery."

Some of these Rats give evidence of considerable mental capacity. The common Wood Rat, for instance, shows such ingenuity in disposing of stolen property that its pranks, attested by unexceptionable testimony, are almost beyond belief. Dr. Hornaday humorously says of it that "seemingly its chief object in life is to play practical jokes on mankind." In the *American Journal of Science* for 1877, Mr. A. W. Chase thus relates his discovery of a Wood Rat's nest in an uninhabited house in Oregon: "This house was left uninhabited for two years, and, being at some distance from the little settlement, it was frequently broken into by tramps who sought a shelter for the night. When I entered this house I was astonished to see an immense Rat's nest on the empty stove. On examining this nest, which was about five feet in height, and occupied the whole top of the stove (a large range), I found the outside to be composed entirely of spikes, all laid with symmetry, so as to present the points of the nails outward. In the center of this mass was the nest, composed of finely divided fibers of the hemp packing. Interlaced with the spikes we found the following: About three dozen knives, forks, and spoons, all the butcher knives, three in number, a large carving knife, fork, and steel, several large plugs of tobacco; the outer casing of a silver watch was disposed in one part of the pile, the glass of the same watch in another, and the works in still another; an old purse containing some silver, matches, and tobacco; nearly all the small tools from the tool closets, among them several large augers . . . all of which must have been transported some distance, as they were originally stored in different parts of the house. The articles of value were, I think, stolen from the men who had broken into the house for temporary lodging. I have preserved a sketch of this iron-clad nest, which I think unique in natural history."

Another characteristic of many of the species is the propensity to store food, often conveyed from a distance. Mr. H. P. Attwater, when collecting the subspecies which bears his name, tore down a number of its houses. "In one of the underground passages at the nest were stored away about three dozen bunches of wild grapes; also many acorns and black haws. In another nest were about two dozen small mushrooms. All the heaps in the cedar brakes contained large stores of cedar berries, most of them with the outside pulp eaten off and the seeds eaten out. What an immense amount of work is necessary before enough can be obtained for a meal, as probably a thousand would be required."

Most of the species are nocturnal, but some, as the Baird Rat, are both nocturnal and diurnal. As soon as darkness falls, "if the cabin of the woodsman is near its haunts, it will be overrun with these animals, and they will be seen on floors and shelves diligently seeking food. In such places they become very bold, climbing upon the bed, and racing over the body of its sleeping occupant."

BRUSHY-TAILED WOOD RAT

Neotoma cinerea (*Ord*)

Other Names.— Brushy, or Bushy-Tailed Pack Rat, Trade Rat.

General Description.— Appearance very much like Eastern Wood Rat, but size larger and tail much broader and bushier. Ears large; body large; tail broad, squirrel-like; hind feet large; whiskers prominent; hair rather long; general color mixed yellowish-brown and black, below white.

Dental Formula.— Same as that of Eastern Wood Rat.

Pelage.— ADULTS: Sexes identical. Seasonal variation occurring, but not especially noteworthy. Above, mixed yellowish-brown and black with more buff and less black on sides; below, white, contrasting markedly with color of sides; hairs of underparts ashy at base except on breast; feet white; ankles dusky; tail rather darker on upper side than the back, lacking the yellow tints, below white except near base where it is brown; hairs of tail a full inch in length. YOUNG: Above, slate-gray thickly mixed with black; below, ashy-white; tail with hairs shorter than in adults.

Measurements.— Total length, 15 inches; tail vertebrae, 7 inches; hind foot, 1.7 inches.

Range.— Rocky Mountain region from southern British Columbia southward into Arizona and westward into central Nevada and California.

Food.— Seeds and green vegetation.

Remarks.— This subgroup has not become so finely split up as that of the Round-tailed Wood Rats and there is but the one species, which has, however, eight subspecies which differ chiefly in coloration and cranial characters.

RELATED SUBSPECIES

Brushy-tailed Wood Rat.— *Neotoma cinerea cinerea* (Ord). Typical animal as described above. Rocky Mountain region from southern British Columbia south to northern Arizona and westward to central Nevada and the Sierra Nevada range in California.

Western Brushy-tailed Wood Rat.— *Neotoma cinerea occidentalis* (Baird). Tail long; ears large; coloration dark. Pacific Coast region of Oregon and Washington eastward to plains of central Idaho.

Yellow Brushy-tailed Pack Rat.— *Neotoma cinerea orolestes* (Merriam). Size large; above buffy ochraceous. Rocky Mountains, Colorado, Wyoming and New Mexico.

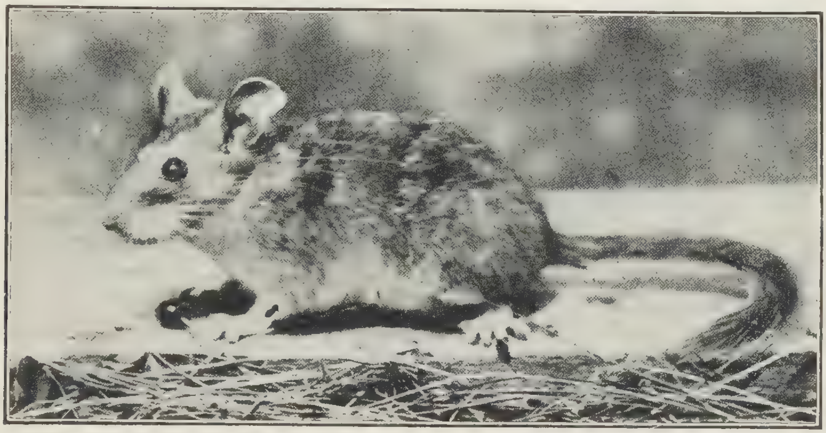
Dakota Brushy-tailed Pack Rat.— *Neotoma cinerea rupicola* (Allen). Size small; above creamy buff lined with black; underparts pure white to base of hairs. Bad Lands, South Dakota through southeastern Wyoming and western Nebraska to northeastern Colorado.

Although a member of the same group as the Eastern Wood Rat, the Brushy-tail deserves separate mention. In its outer markings it is seen at a glance to be noticeably different. This is a mountain-living Rat, living in timber and generally in rocky localities.

The Brushy-tailed Wood Rat is far handsomer than its cousins of the genus *Neotoma*. Instead of the common, ordinary tail, scaly, long, and naked, it has one resembling that of the Squirrel, well covered with hair, and bushy to boot. There are several forms found in British Columbia, western Canada, the Pacific coast region of Oregon and Washington, eastward to the plains of central Idaho. Its habits are similar to those of the other Wood Rats, above described, its houses and nests being built of the usual materials. The Indians on the Stony River, Alberta, called these Rats "medicine rats," in allusion to the musk glands.

This industrious little beast is commonly known in the West as Trade Rat, or Pack Rat, from its well-known habit of carrying things from one place to another, and often leaving other things in exchange, or trade. Many amusing stories are told to illustrate this propensity. On one occasion the Rat removed a quantity of rice from a cupboard jar to an old hat in a storeroom, bringing back in exchange some perfectly good collar buttons. On another, the busy animal, or animals carried a lot of seeds from a drawer and hid them in a vase. This time they did not offer anything in exchange. Their thieving propensities are not limited to things they can use — in fact, the wider the assortment of material collected, the better they like it. And the things given in barter may be anything from rubbish to articles of value. Generally speaking, they do little harm. Their antics are merely absurd.

As might be expected, the home of this night prowler is fearfully and wonderfully made. On the plains the nests are conical and composed chiefly of sticks; but (according to Edward A. Goldman of the U. S. Biological Survey) thorny vegetation, bits of cactus, bones, stones, leaves, and almost anything else they can carry enter into the construction of their homes. The habit of building nests of sticks and of accumulating more or less such material about the entrances to their burrows, even when in rocky places, is common to most of the species. Many bushels of trash are often piled against a rock or the trunk of a tree or in a small cave. These nests, or burrows, have from one to half a dozen or more entrances to chambers, both above and below the surface of the ground. More or less well-defined runways usually radiate in several directions from the entrances into the surrounding vegetation or may connect nests many yards apart. Occupied nests may be known at a glance by their well-kept appearance. Slight additions and repairs are made frequently, and the runways are cleared of sticks and leaves. Sure signs of occupation are a few freshly cut twigs or leaves laid on or stuck into the upper walls.



Photograph by the U. S. Biological Survey

BRUSHY-TAILED WOOD RAT

A young specimen of a group that is larger and handsomer than its near kin, and is also marked by a long bushy tail, instead of the usual naked or scaly appendage

On desert plains a thick clump of cactus or other thorny vegetation is frequently chosen as the nest site, and here pieces of cactus are the chief material used in construction. Often the entire nest is a bristling mass of thorns, and as a further protection some especially spiny sections are placed about the openings and along the smoothly worn runways. When it is remembered that many of the spines have barbed points sharper than needles, which enter the flesh at the slightest touch, it is difficult to understand how the builders transport such material or are themselves able to travel without being pierced.

Wood Rats are expert climbers, and some species, in addition to building surface nests three to five feet in height, often place them twenty feet or more from the ground among the upper branches of trees. None of the species is known to enter water voluntarily, but in Mexico, near the borders of lagoons, at least one of the species occasionally builds nests in the tops of mangroves, from which a single well-worn route always leads through the thick branches out to feeding grounds on the shore, perhaps fifty or seventy-five yards away. Wood Rats do not frequent towns, but often live in the vicinity of farmhouses, and have been known to carry off spoons, knives, forks, pieces of cloth, and many other articles, and add them to their nests.

They are chiefly nocturnal in habits, but some are partly diurnal. Their food is largely determined by varying local conditions, but consists mainly of a great variety of green vegetation, including grass, leaves, fresh fruit, small bulbs, bark, and cactus stems. Dry seeds, nuts and fungi are also eaten. During successive seasons of drought in the Rio Grande valley, when ordinary food is scarce and in consequence most small mammals are greatly reduced in numbers, Wood Rats maintain their usual abundance by recourse to the large, soft, juicy cactuses.

Wood Rats have numerous deadly enemies such as owls, hawks, snakes, wild cats, civet cats, coyotes, foxes and probably weasels, which serve to keep their numbers in check. Some of the desert species are sufficiently numerous to inflict appreciable damage on growing crops in fields and gardens and to carry off considerable grain stored on farms, but they have not thus far proved as injurious as some other rodents. In the arid regions of the Southwest they girdle and kill many native shrubs and severely injure cactuses, especially during the long dry season when food is scarce.

COTTON RAT

Sigmodon hispidus *Say and Ord*

Other Name.— Marsh Rat.

General Description.— A fairly large rodent intermediate in size between the House Mouse and the common Norway Rat. Head rather broad; nose pointed; ears nearly hidden in the long hair; body fairly thickset; tail slender, scaly, thinly haired, shorter than head and body; legs short, slender; pelage long, coarse, hispid; color above, grayish-buff grizzled with black; below, dull white.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{0-0}{0-0}$; Molars, $\frac{3-3}{3-3}=16$.

Pelage.— ADULTS: Sexes identical, seasonal variation very slight. Above, pale yellowish-gray, coarsely grizzled with black, paler on sides; lower parts ashy or dull white; ears plumbeous at base; feet grayish-white; tail blackish above, grayish below. YOUNG: Similar to adults but grizzled appearance lacking.

Measurements.— Total length, 10 inches; tail vertebrae, 4 inches; hind foot, 1.3 inches.

Range.— Eastern United States, Carolinas to Florida.

Food.— Seeds, grasses and green vegetation; occasionally flesh.

Remarks.— The Cotton Rats are related to the Rice Rats but because of their coarse hair and bristling coat they are not liable to be confused with any other rodents. Like the Rice Rats, this group is of southern origin and only the northern forms come into the United States. Eight species and subspecies of this rodent are found north of the Rio Grande, but this genus is distributed well down into South America.

RELATED SPECIES

Cotton Rat.— *Sigmodon hispidus hispidus* Say and Ord. Typical animal as described above. Carolinas to Florida.

Texas Cotton Rat.— *Sigmodon hispidus texianus* (Audubon and Bachman). Smaller than the Common Cotton Rat. Texas and Oklahoma.

Pallid Cotton Rat.— *Sigmodon hispidus berlandieri* (Baird). Small; ears larger; color paler than common Cotton Rat. Eastern desert tract upper Rio Grande, Texas and New Mexico.

Least Cotton Rat.— *Sigmodon minimus* Mearns. Underfur dark; ears, feet and tail densely haired; grayish mixed with blackish and light yellowish-brown. Mountains of southern New Mexico, Arizona and south into Mexico.

The Cotton Rat may be distinguished from the Meadow Mouse, to which it bears a certain resemblance, by its long tail. It is a thickset animal about two-thirds as large as the common House Rat, and what it lacks in size it makes up in courage and destructiveness. According to Hornaday, it is "vicious in temper and voracious in appetite. It is fond of flesh, and when several are caged together, the stronger ones do not scruple to kill and eat weaker rats of their own kind."

Cotton Rats inhabit the Southern States and Mexico, the range of the common species extending from North Carolina to northern Florida and west to southern Louisiana. In the eastern half of Texas a paler and smaller form occurs. Individuals of this species, though common, are not often seen, as they live under cover of tall grass and weeds and along the banks of streams and ditches. They make bulky nests of grass either on the surface or in underground burrows. Their runways are very extensive, a perfect network of them often connecting the several burrows. Along these runways they cut the green stems of grass and various plants, eating the stems, leaves, and seeds; and they gather on the edges of grain fields where they feed on both the green and the ripening grain.

They are especially numerous along the borders of cotton fields, and, according to Bailey, the runways opening into the fields are often fairly lined with cotton that has been pulled from the bolls and dragged under cover where the seeds can be eaten in safety. "The loss of cotton is not great in any one field, but, considered over the entire range of this group of Cotton Rats, it is considerable." Bailey thinks that a simple and effective means of getting rid of these pests would be "to clean out the borders of fields by burning the weeds, grass, and rub-

Photograph from U. S. Biological Survey

COTTON RAT

The Cotton Rat is a fighter, vicious in temper, and greedy in appetite. It is fond of flesh

bish accumulating along the fences year after year as a harbor for various rodent and insect pests. If these borders were burned yearly, mowed and raked, treated with oil or chemicals to prevent weed growth, closely pastured, or thoroughly cultivated, the hawks and owls would quickly dispose of the rodents, which would then have no protecting cover."

Like the Rabbits and Varying Hares, Cotton Rats have their periods of abundance; and sometimes their increase assumes the proportions of a veritable plague. Mr. H. P. Attwater thus tells of one of these "invasions": "In the year 1889, *Sigmodons* appeared suddenly in this (Bexar) county in great numbers, and were known as 'tramp Rats.' Where they came from, or from which direction, I have been unable to find out. Thousands first appeared about the first of May, and were heard from in all the region for many miles around San Antonio. They made their nests with the Wood Rats in the bunches of *Opuntia,* with a network of runways leading in every direction, through which they were often seen running in the daytime. They seemed to agree with the Wood Rats, but in the oat stacks and around the ranch buildings the common Brown Rats fought, killed, and ate them. Mr. Watson's boys killed over one hundred in one afternoon in a brush fence, and for several months their cat used to bring in from six to twelve every night. He says that on one occasion, when the rats were thickest, they counted thirty-eight which this cat in one night had piled up in the wood box for the amusement of her kittens. The bulk of these Rats stayed for about eighteen months. After the crops were gathered they began to get scarce, and gradually disappeared. Whether they died out or 'tramped' out I am unable to say, but I am inclined to think many of them migrated."

Cotton Rats are very prolific, the females producing eight, and occasionally eleven young at a birth. They have a host of enemies. Hawks sit on the telegraph and fence posts and watch for them, frequently diving into the grass for their prey; barred owls "remove" them nightly, and short-eared owls migrating northward stop over to feast upon them. Weasels, Skunks, dogs, and cats hunt them; and rattlers and other snakes, distributed in their retreats, have been "found gorged with Cotton Rats."

RICE RAT

Oryzomys palustris (*Harlan*)

Other Names.— Rice Field Mouse, Marsh Mouse.

General Description.— A rather large Mouse with a much heavier body than the common House Mouse. Head of moderate proportions; nose pointed; ears of medium size nearly buried in the fur and clothed with short hairs; body slightly thick-set; feet of normal proportions; hind feet large; soles naked; tail scantily haired, about half of total length; general color above, dark brown to pale brown; below grayish; hair rather coarser than that of the House Mouse.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{0-0}{0-0}$; Molars, $\frac{3-3}{3-3}=16$.

Pelage.— Adults: Sexes identical. Seasonal variation while present not especially noticeable. Above, dark-brown shading into pale-brown, washed with buffy on sides; grayish beneath, the hairs with plumbeous bases and tipped with white, but with grayish underfur showing through; tail above dark, below pale, very scantily haired; feet whitish. Young: Slate gray.

Measurements.— Total length, 8.8 inches; tail vertebrae, 4.4 inches; hind foot, slightly over 1 inch.

Range.— New Jersey to Georgia.

Food.— Seeds, grasses and various plants.

Remarks.— An extensive group which ranges from New Jersey southward over a large part of South America. In the United States only a few species and subspecies, four in number, come under consideration. These four differ only in minor details.

Related Species

Rice Rat.— *Oryzomys palustris palustris* (Harlan). Typical animal as described above. New Jersey to Georgia, westward to eastern Texas.

Texas Rice Rat.— *Oryzomys aquaticus* Allen. Large; feet small; yellowish-brown above. Southeastern Texas.

Florida Rice Rat.— *Oryzomys natator natator* (Chapman). Largest of the United States Rice Rats; coloration darker. Florida west to Texas.

The Rice Rats are quite closely related to the Cotton Rats and to the White-Footed Mice; but from the latter they are easily distinguished by their more robust form and coarsely haired tail as well as larger hind feet; while the Cotton Rats have coarser fur. At first glance one might also have considerable difficulty in distinguishing them from the young Norway Rats; but a closer examination will show that the Rice Rat has a longer tail, is browner in color, and has glossy brown hairs inside its ears, as well as a fringe of white hairs on the lower part of each ear.

The Rice Rats are far more numerous south of the Rio Grande than above it. They have long tails very scantily haired, and to a great extent are inhabitants of the Tropics. In the United States, they must be looked for on the eastern and southeastern coasts, but in Mexico they may be found at altitudes of 10,000 feet or more above sea level.

The typical Rice Rat of North America is found mainly in the coastal marshes of southern New Jersey to the Gulf States, and is most abundant in the banks of rice fields. Some varieties, however, live on sandhills. On Matagorda Island, Texas, Oberholser found them "tolerably common in the tufts of coarse grass bordering bayous, making conspicuous runways where the grass is thickly matted;" and on a small reef off the north end of Padre Island "they were found in patches of marsh 'cranberry.' Two of their round, cup-shaped nests, composed of fine rootlets, were found under old boards." These species are good swimmers and take to water readily.

HOUSE MOUSE

Mus musculus *Linnaeus*

General Description.— The common Mouse found about dwellings. Nose pointed; ears fairly large; body neither thick-set nor slender; tail quite long, longer than head and body; legs fairly long; color above yellowish-brown; hair fairly soft.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{0-0}{0-0}$; Molars, $\frac{3-3}{3-3}=16$.

Pelage.— Adults: Sexes identical. Seasonal variation slight. Above yellowish or grayish-brown; below, paler, generally ashy-brown, sometimes black hairs along back mixed with yellowish-brown; feet brown; tail dusky, somewhat lighter below; hairs of tail short and scanty. Young: Slaty-gray all over.

Measurements.— Total length, 6.3 inches; tail vertebrae, 3.2 inches; hind foot, .7 inch; ear from notch, .6 inch.

Range.— Practically throughout all North America in districts inhabited by man, and to a certain extent to be found away from settled localities.

Food.— Somewhat omnivorous, but showing preference for grain and vegetable food.

Remarks.— An introduced species, coming from Europe. Only one species has gained a footing in North America.

The House Mouse, like the poor, we have always with us. It is the most democratic as well as the most familiar of all our mammals, making its home with equal readiness in the lowly East Side tenement and the palatial Fifth Avenue mansion. No part of a house is sacred to it; no article of furniture, however costly, if suitable in shape and favorably placed, is too good to serve as its nest; no dish of flesh, fish, or fowl, if left within its reach, is either too coarse or too delicate for its palate.

Not every Mouse found in the house, however, is the common House Mouse. Field Mice often gain entry to houses and establish themselves in a very short space of time. The writer once occupied a cottage on Staten Island that was covered with creepers, and the vines overran the wire screens, which in the hall and pantry windows were allowed to remain in position the year through. Often in the dusk, and sometimes in the daytime, we could see the little Field Mice running across the screens. One day some boys, playing baseball in the back yard, sent a hard-batted ball against the pantry screen and broke a hole in it. Not long afterward we found that the pantry was overrun with Mice. The parrot's cage was placed at dark each day in a recess in the pantry, and some Field Mice were seen helping themselves to the birdseed in the cage. They had evidently gained access through the hole in the screen. A circular trap with four springs was attractively baited for the intruders, and on three successive nights was filled with victims. The fourth night a solitary Mouse, the thirteenth, and unlucky, was found in the trap, and that was the end of our visiting field mice, and of their possible aspirations to be considered House Mice.

On the other hand, House Mice in choosing their dwelling-places do not always confine themselves to houses. Mr. Vernon Bailey, when making a biological survey of Texas, a few years ago, found that they were "by no means confined to houses and outbuildings, but over much of the country had become established in the fields, meadows, hedgerows, and weed patches, from which they collect in the stacks of hay and grain, and are ready to attack each crop as it matures."

The appearance and habits of this little rodent are well known. House Mice are very prolific, and soon become a nuisance, if not checked. They begin to breed when three months old, and have litters at intervals of eight or ten weeks all the year round. There are usually five or ten young at a birth. White Mice in captivity breed oftener and have larger litters. Their nests are made in the oddest and the most unsuspected places. Stone and Cram give the following account of a nest that was made in an old-fashioned sausage-filler: "It was made of tin bottle-shaped and open at both ends, and into the larger one was thrust a piece of wood which just fitted it. The remaining space was occupied by a Mouse's nest of rags and scraps of paper, the funnel-shaped opening serving as an entrance, through which the mother Mouse had probably come and gone hundreds of times in ministering to the needs of her family."

A New York family on returning from the shore about five years ago found that a Mouse had made its nest in a valuable Chinese bowl on

Photograph by S. A. Lottridge

HAVING A FEAST

Flashlight picture of a House Mouse on a loaf of bread a side table in the parlor. The present writer had an experience which is no less interesting. In his work he used an ordinary pedestal writing table, in the bottom left-hand drawer of which were newspaper clippings. It was a busy editorial office and there were at least forty persons in the room, many of whom were continually passing the table. One day on opening the drawer a Mouse sprang out, leaving behind it a litter of ten young in a cozy little nest made entirely of pieces of newspaper which had been torn into mere shreds. The eyes of the little Mice were closed and the animals themselves were hairless.

Photograph by the West Va. University Experiment Station

HOUSE MOUSE

Flashlight picture secured just as this little pest was having a drink

It seems to be well established that the House Mouse is to a certain extent musical; at any rate, that it has a kind of song. Mr. Ernest Ingersoll cites from the *Scientific American* the following: " A few winters since, while one of the family was amusing herself at the piano, a Mouse made its appearance on the threshold of the apartment, and, undismayed by the light or the presence of the family, chirped and caroled with intense satisfaction to itself and to the great delight of its audience. Frequently afterward, but always in the evening, the rare songster repeated his performance. The piano keys were never struck that the Mouse did not follow; but when the instrument was not touched, the music from the Mouse would come, as if for a reminder." Dr. Coues attributed these " singing " exhibitions to an affection of the throat, but they are now supposed generally to be quite natural.

Another " accomplishment " is the dancing or waltzing of the small black and white Japanese Mice. Mr. S. C. Lloyd (in *Country Life in America*) advocates breeding these Mice as a source of income. They sell for $1 to $1.75 each. " As soon as they have their eyes open," he says, " they commence to spin round, and they keep this up through life." Mr. Lloyd has trained his White Mice to " pull little circus wagons with a tiny Mouse inside; to shoot the chutes; to climb ladders and perform on the trapeze; to walk tight ropes, and to tell fortunes. The trouble involved in teaching is very small when compared with the profits, the only equipment expense being that of a suitable cage which lasts a life-time."

Albert Porter.

GRASSHOPPER MOUSE

Onychomys leucogaster (*Wied*)

Other Names.— Scorpion Mouse, Mole Mouse.

General Description.— A thick-set, short-tailed Mouse, noticeably larger and heavier than the House Mouse. Head large; ears of moderate height covered with very short hair; body rather thick-set; tail short, thick, blunt, covered with short hairs and about half length of head and body; legs of moderate length; fore feet large with long claws; general color grayish-brown above, yellowish-red on sides, and below clear white; hair on body long, lax and remarkably soft. Nocturnal in habit.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{0-0}{0-0}$; Molars, $\frac{3-3}{3-3}=16$.

Pelage.— ADULTS: Sexes identical. A seasonal variation, but not very conspicuous. Above, grayish-brown, darker along dorsal region, becoming yellowish-red on sides, and graduating into a line of fulvous; underparts, feet and outside of fore legs white; tail blackish-brown above, underside and terminal eighth, white. YOUNG: Mouse gray above, below white.

Measurements.— Total length, 6 inches; tail vertebrae, 1.7 inches; hind foot, .9 inch.

Range.— Dakota, Missouri, Nebraska, Kansas, Oklahoma, Indian Territory and Texas.

Food.— Largely insects, grasshoppers, scorpions, crickets, beetles and occasionally other Mice, as well as some seeds and vegetation.

RELATED SPECIES

Grasshopper Mouse, or Scorpion Mouse.— *Onychomys leucogaster leucogaster* (Wied). Typical animal as described above. Plains of Dakota, Missouri, Nebraska, Kansas, Oklahoma and Texas.

Gray Scorpion Mouse.— *Onychomys leucogaster fuscogriscus* Anthony. Similar to *leucogaster,* but coloration richer and colors more contrasting. Oregon and Washington.

California Scorpion Mouse.— *Onychomys ramona* Rhoads. Smaller than the above species, coloration brighter, more red. Southwestern California.

Long-tailed Grasshopper Mouse.— *Onychomys longicaudus* Merriam. Above, cinnamon fawn with black-tipped hairs; tail about 2.15 inches. Utah.

Yuma Grasshopper Mouse.— *Onychomys torridus perpallidus* Mearns. Size large; coloration very pale. Arizona and California in southern desert region.

Dusky Grasshopper Mouse.— *Onychomys fuliginosus* Merriam. Size rather large; ears large; pelage somewhat coarser than in the other species; blackish-slate above. Northeastern Arizona.

The Grasshopper, or Scorpion, Mice are a well characterized group related to the White-footed or Deer Mice, but are easily distinguished from the other Mice by their coloration, when taken in connection with their short thick tail and heavy body. They are probably the least dependent upon a vegetarian diet of any of our Mice and are also adapted for burrowing as is shown by the long claws on the fore feet. There are some fifteen species and subspecies ranging in the United States. These forms are strictly plain or desert types.

Grasshopper Mice are nocturnal. They especially frequent sandy areas, and are often taken in traps set at the burrows of Kangaroo Rats, Ground Squirrels, and Pocket Mice. Their carnivorous propensity is one of the chief obstacles the collector meets in trapping the rarer desert Mice, and often after nights of trapping without success he is chagrined to find in one of his traps the partly devoured and mangled remains of a rare Pocket Mouse. Sometimes in regions where Grasshopper Mice are plentiful, a miscellaneous catch of other species will be almost ruined by them. Much of the food of Grasshopper Mice consists of soft-bodied insects, such as grasshoppers and crickets. The name Scorpion Mice, sometimes applied to these rodents, is due to a marked fondness for scorpions, which probably form part of their food in Colorado, particularly in the Southwest. Vegetable food is also eaten.

In some one of its varied forms, the Grasshopper Mouse is found from the Dakotas south to Texas. They vary considerably as regards their haunts. The pale form prefers a sandy soil with a good growth of sagebrush. Mr. Vernon Bailey ("Biological Survey of Texas,") says: "They make few holes, though two were taken at the mouths of small burrows. They are strictly nocturnal, and, while never seen by daylight, their long-drawn fine whistle is often heard in the grass between dusk and early dawn. The morning round of a line of traps usually reveals one or more specimens that have been attracted by the oatmeal bait." Another Texan form, large and dull-colored, inhabits grassy, brushy land in the half-open cactus and mesquite country, and is found in the woods as well as in the open. It also is strictly nocturnal, and its shrill whistle has been heard not far from camp fires. The Dusky Mouse of the Painted Desert and the high mesas, northeastern Arizona, is a remarkable example of color adaptation to environment, its slate-black hue according perfectly with the black lava beds in which it has its home.

HARVEST MOUSE

Reithrodontomys humulis *(Audubon and Bachman)*

General Description.— A very small Mouse scarcely more than one-half the weight of the House Mouse. Head small; nose pointed; ears rather large, thinly haired; body slender; tail long and scantily coated with hair; feet of moderate length, slender; front incisors with conspicuous longitudinal, median groove; general color above, fuscus brown; underparts dingy gray; hair of moderate coarseness.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{0-0}{0-0}$; Molars, $\frac{3-3}{3-3}=16$.

Pelage.— ADULTS: Sexes identical. Seasonal variation occurring but not especially conspicuous. Above, fuscus-brown, darker along median dorsal line; sides more fulvous, with indistinct lateral line; underparts dingy-gray tinged with fulvous; feet whitish; ears dusky; tail above dusky, below grayish-white. YOUNG: Similar to adults but grayer.

Measurements.— Total length, 5 inches; tail vertebrae, 2.2 inches; hind foot, .7 inch; ear, .4 inch.

Range.— Coast district of South Carolina and Georgia, southward into Florida.

Food.— Seeds and grain.

RELATED SPECIES

Harvest Mouse.— *Reithrodontomys humulis humulis* (Audubon and Bachman). Typical animal as described above. South Carolina, Georgia, southward into Florida.

Merriam's Harvest Mouse.— *Reithrodontomys merriami* Allen. Smaller and darker. Coast district of southwestern Louisiana into Texas.

Kansas Harvest Mouse.— *Reithrodontomys dychei dychei* Allen. A small, dark form with spots at base of ears. Kansas east to St. Louis, Missouri, south to Oklahoma, north to Nebraska and southwestern Iowa.

Mountain Harvest Mouse.— *Reithrodontomys montanus* (Baird). Coloration above brown, below yellowish-gray. Colorado.

Large-eared Harvest Mouse.— *Reithrodontomys megalotis megalotis* (Baird). Largest of the Harvest Mice, ears large, total length nearly 6 inches. Western New Mexico, eastern Arizona, Utah, California and southern Nevada.

Long-tailed Harvest Mouse.— *Reithrodontomys longicauda longicauda* (Baird). Size small, colors dark; tail long, more than half the length of head and body. Western California.

Drawing by Henry Thurston

HARVEST MOUSE

One of the smallest of our native Mice, weighing about half as much as the House Mouse. A creature of the open, grassy country

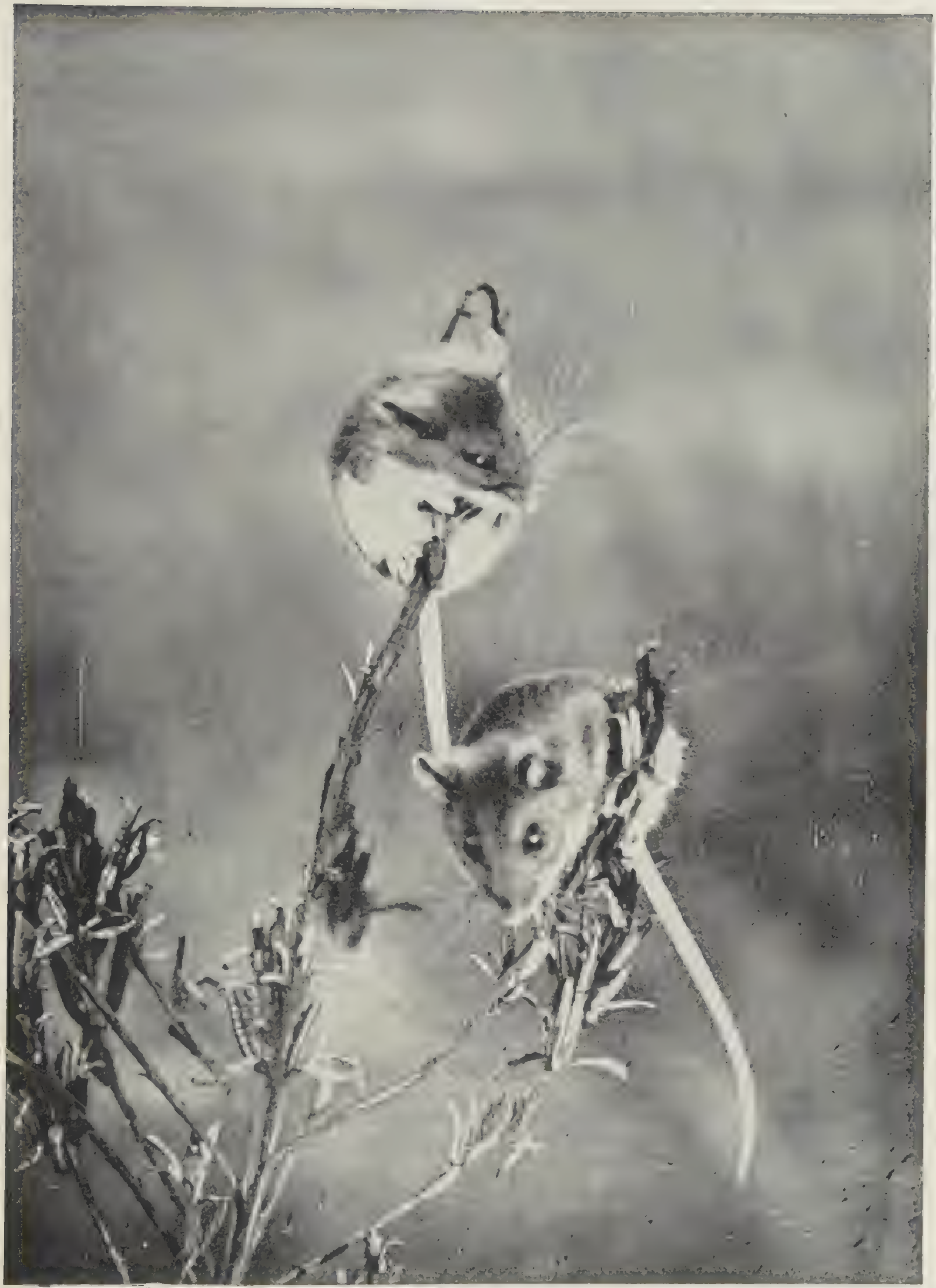
The Harvest Mice are, with the exception of the Pocket Mice, the smallest of North American rodents. They are more delicately constructed than any of the other Mice, and both by this character and the groove on the incisors they may be distinguished from the White-footed or Deer Mice, which they most closely resemble, and to which their relationships connect them. This group has been classified into a great number of species and subspecies. In all fifty-nine are known north of Panama, of which about twenty-two have ranges in the United States. The group inhabits temperate to tropical areas and is not found north of the United States. In western North America specimens have been taken as far north as Washington, Montana, and North Dakota, but east of the Mississippi River the animal has not been found north of the Ohio and Potomac valleys.

Harvest Mice are partial to open grassy localities. Some species like moist places; others live in sandy, dry uplands; still others inhabit marshes exclusively; while some of the Mexican species ascend mountains to the timber line. Their nests are substantial constructions, lined with soft materials and built in widely varying positions. Vines, low trees, woodpeckers' holes, fences, deserted birds' nests, cornstalks (the nests in these cases being made of corn silk), cracks in the ground — such are some of the places in which nests of the Harvest Mouse have been found. Bailey thus relates his discovery of a nest of the Rio Grande Harvest Mouse with a very sleepy tenant, near Corpus Christi, Texas: "I found what looked like an old verdin's nest in a bush of *Momesia pallida* near Corpus Christi. The nest was about four feet from the ground, a globular structure of grass, lichen, and short gray moss, with a small opening at one side. As I touched the side, two black eyes appeared at the doorway, but after watching me for a moment were withdrawn. At a slight shake of the bush, out popped a trim little long-tailed Harvest Mouse, which sat undecided on

Photograph by H. T. Middleton

WHITE-FOOTED MOUSE

The alert photographer caught this little beast in the open, as he scampered up a thistle



Photograph by H. T. Middleton

EASTERN WHITE-FOOTED MICE

Also called Wood Mice because they are often found in forests of evergreen or deciduous trees. Photograph nearly life size the branch for a moment and then ran gracefully along branches and stems from one bush to another and finally down to the ground, where it disappeared in the tall grass. On examining the nest I found a firm base, evidently an old bird's nest that had been arched over with a substantial roof which left an opening at the side only large enough for my finger. It was neither a verdin's nor a cactus wren's nest, and had evidently been built by the present tenant. When I returned next day, the Mouse was at home, but so sleepy that I merely disturbed him enough to make him come out and sit a moment on the branch, after which I withdrew and let him go back to finish his nap."

Photograph by S. A. Lottridge

NEST OF A HARVEST MOUSE

The food of the Harvest Mouse consists principally of seeds, grain, green vegetation, and, occasionally, fruit. Most of their food must be obtained from wild plants of little or no value to man. In Bexar County, Texas, they were found to be fond of peaches, eating the peach and leaving the stone hanging on the tree; and at Metlaltoyuca, Mexico, one was caught on a bunch of bananas hanging about eight feet above the ground. Mr. Arthur H. Howell, of the United States Biological Survey, says that only rarely is any damage to crops by Harvest Mice reported; and Bachman, who had studied its habits closely, remarks: "We doubt whether this species is of much injury to the farmer. It consumes but little grain, is more fond of residing near grass fields, on the seeds of which it subsists, than among the wheat fields."

The breeding season extends from April to October in northern latitudes; in tropical regions it is probably spread over the whole year. The young produced at a birth number from three to seven and rapidly attain their maturity. But owls and other enemies keep their numbers down.

EASTERN WHITE-FOOTED MOUSE

Peromyscus maniculatus (*Wagner*)

Other Names.— Deer Mouse, Wood Mouse.

General Description.— A medium-sized Mouse of normal proportions, slightly larger than the common House Mouse. Nose pointed; head of moderate proportions; ears large, prominent, covered with very short hair; eyes large; whiskers prominent; body medium; tail long, about length of head and body, and well clothed with short hair; limbs slender and of moderate length; general color above, yellowish-brown; below, clear white; hair of moderate length and quite soft.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{0-0}{0-0}$; Molars, $\frac{3-3}{3-3}=16$

Pelage.—ADULTS: Sexes identical. Seasonal variation occurring but not especially conspicuous. Above varying from bister to yellowish-brown; below clear white, the white meeting the color of the sides in a clearly defined lateral line; feet white; tail above like back, below white, sharply bicolor. YOUNG: Slate gray.

Measurements.— Total length, 6.5 inches; tail vertebrae, 3 inches; hind foot, .8 inch.

Range.— Northeastern Canada from Labrador to Hudson Bay, and south to northeastern United States.

Food.— A great variety of seeds, grain, nuts, acorns, leaves and grasses.

RELATED SPECIES

Eastern Deer Mouse.— *Peromyscus maniculatus maniculatus* (Wagner). Typical animal as described above. Northeastern United States and west to Hudson Bay.

Arctic White-footed Mouse.— *Peromyscus maniculatus borealis* Mearns. Much shorter tail than Eastern Deer Mouse. Interior of northwest Canada.

Canada White-footed Mouse.— *Peromyscus maniculatus gracilis* (LeConte). Larger, with longer, more hairy tail and less rusty coloration. New Brunswick south to central New York and western Massachusetts.

California Deer Mouse.— *Peromyscus californicus* (Gambel). Largest of the Deer Mice north of the Rio Grande. Similar to Eastern in general proportions but body much larger (4 inches); ears very large;

tail very long, more than half the total length, very sparsely haired, the annulations of the tail plainly visible; hair very long, lax and soft. General color, dark gray mixed with light brown; below grayish buff. Coast region of California from San Francisco Bay south to Santa Barbara in open forest, in brush and in valleys of lower mountains.

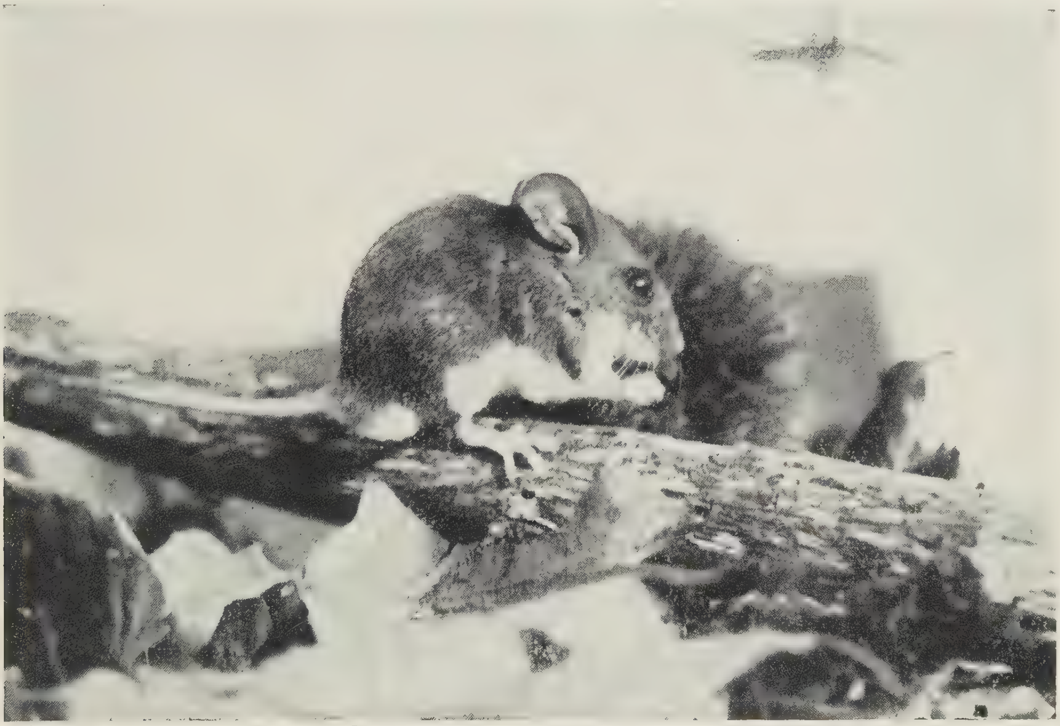
Large-eared Deer Mouse.—*Peromyscus truei truei* (Shufeldt). Size medium; tail a little less than head and body in length; ears very large. Southwestern United States.

Desert Deer Mouse.—*Peromyscus eremicus eremicus* (Baird). Size medium; tail very long, longer than head and body; colors pale. Desert regions of southeastern California eastward to western Texas.

Golden-breasted Deer Mouse.—*Peromyscus crinitus auripectus* (Allen). Size medium; hairs long and silky; coloration bright above; yellow spot on breast; rest of underparts white. Northeastern Arizona, southeastern Utah and adjacent parts of Colorado and New Mexico.

Nuttall's Deer Mouse.—*Peromyscus nuttalli nuttalli* (Harlan). Tail less than head and body in length; coloration bright orange. Southeastern Virginia and northern North Carolina west to central Kentucky.

Taylor's Deer Mouse, or Little Deer Mouse.—*Baiomys taylori taylori* (Thomas). One of the smallest of North American Mice; coloration yellowish-brown thickly lined with black; tail indistinctly bicolor; total length, 3.5 inches; tail vertebrae, 1.4 inches. Southern Texas.



From West Va. University Experiment Station

WHITE-FOOTED MOUSE

An interesting and accurate life photograph, showing a characteristic pose of this small rodent, which is feeding on a nut

The White-footed Mouse is by far the most beautiful species of the family to which it belongs. Indeed it is almost a shame to call this handsome creature a mouse at all! He is almost a dandy in dress and neatness, and his spotless robe of grayish fawn above is sharply contrasted with the pure white beneath. This, coupled with the natural grace and agility of his movements, distinguishes the White-footed Mouse as one of our most attractive little mammals.

Combined with this grace and beauty there is a gentleness of disposition reminding one of the Flying Squirrel. It is said that these two little wood-dwellers are sometimes found living in the same cavity. An adult White-footed Mouse, when captured wild, will seldom bite if taken in the hand, and after two or three days of confinement is as gentle and confiding as though it had been born in captivity.

The home of the White-footed Mouse is occasionally found in deep forests of evergreens or deciduous trees; but its usual abode is along hedgerows, in the fields, or even in dwellings about well-wooded sections of the country. The hunter's camp is very sure to be visited by them.

and sometimes their friendliness becomes a burden. While their usual food is nuts and seeds of various kinds, they soon learn to eat almost anything about the camp. These little fellows show a most surprising capacity for food, and when once a hungry horde of them takes possession of the camp, well may the hunters and trappers look carefully after their stock of provisions; for when the snow lies deep through the forest and the nearest store is forty miles away, then every ounce of flour and meal is precious.

This little rodent has sharp teeth which he sometimes uses in a careless and inconsiderate manner, as cord, fish-line, hunting-tackle and even snares set for other animals are cut to pieces. The trap is often sprung and the bait which might have caught a Mink or Marten has been devoured by this small midnight marauder.

Under favorable circumstances the White-footed Mouse stores up considerable quantities of beechnuts for winter use. These seem to be his favorite nuts. Occasionally, when nuts are not obtainable, seeds and grains of various kinds are stored. The nuts are usually shucked when gathered — at least this has been the present writer's observation — and placed in a hollow of a tree or log. Woodsmen often find stores of nuts. Several years ago I found a storehouse of some White-footed Mice in a cavity of a maple tree. There were nearly three and a half quarts of as beautifully shucked nuts as anyone would wish to see. Only last year I found in a stump another storehouse, containing a quart of beechnuts and an equal amount of buckwheat.

The White-footed Mouse, like some of the Squirrels, constructs an outside nest in thick tangles of bushes from four to ten feet above the ground. The favorite location seems to be about some gently inclined vine, such as the wild grape, which affords a natural and easy highway from the ground to the home of the wee architect. The nests are slightly globular in shape, and composed of dried leaves, grasses, moss and fibrous barks of various kinds, the material being closely compacted and the general appearance very pleasing. The entrance is usually on the lower side. Sometimes the foundation is an old bird's nest, very often that of a cat-bird. I once found a nest that was fifteen inches in length and about eight inches in diameter, this being the most irregular in shape as well as the largest one that I ever saw.

Occasionally several Mice will occupy the same nest, and if disturbed they hasten out, making their way along the branches to the ground. If the disturbance is slight, they come out upon the branches, gaze about on all sides and gently sniff the air, not returning until they are satisfied that all danger has passed.

"Singing Mice" are reported from time to time, and even among the White-footed variety they are no exception, according to a note that appeared in the *American Naturalist* several years ago by Mr. Hiskey, who wrote as follows:

"I was sitting a few evenings since not far from a half-open closet door, when I was startled by a sound issuing from the closet, of such marvelous beauty that I at once asked my wife how 'Bobbie Burns' (our canary) had found his way into the closet, and what could start him to singing such a queer and sweet song in the dark. I procured a light and found it to be a Mouse! He had filled an overshoe from a basket of popcorn which had been popped and placed in the closet in the morning. Whether this rare collection of food inspired him with song I know not, but I had not the heart to disturb his corn, hoping to hear from him again. Last night his song was renewed. I approached him with a subdued light and with great caution, and had the pleasure of seeing him sitting among his corn and singing his beautiful solo. I observed him without interruption for ten minutes, not over four feet from him. His song was not a chirp, but a continuous song of a musical tone, a kind of to-wit-to-wee-woo-woo-wee-woo, quite varied in pitch."

The White-footed Mouse reproduces very rapidly, as there are from two to four litters in a year and from three to six young in a litter. This Mouse has many enemies, such as the Fox, Wild Cat, various kinds of owls, house cat, and, the most formidable of all, the common Weasel.

Once while passing through a thicket, an unfamiliar sound caused the present writer to stop and listen. Peering through the brush I discovered a screech owl standing on the side of an old bird's nest, only a short distance away. It was after sundown, but the light was sufficient to enable me to see objects quite distinctly some distance away. The owl was absorbed in tearing apart what, at first sight, I supposed to be the bird's nest. So intently was he engaged in this task that I approached unobserved, and when within thirty feet of the bird I discovered that a White-footed Mouse had placed his home on the top of the bird's nest. The owl evidently knew that it was the abode of the Mouse, for he was opening the nest by using both his beak and claws. Suddenly a White-footed Mouse sprang from the nest, which was not more than four feet from the ground, and struck upon the dried leaves below. Instantly the owl dropped upon him and bore him away in his talons.

The White-footed Mouse is a very interesting pet. In captivity it resembles in many ways the Flying Squirrel, especially in its fondness for climbing about one's person and hiding in the pockets. During the day it usually remains in its nest, but at twilight it becomes very active and playful. There are many different species of this graceful little rodent; that is to say, it has adapted itself to its surroundings so completely — wherever it may choose to make its home — as to become differentiated in a great variety of characters. There are recognized north of the Rio Grande some sixty-eight species and subspecies of Mice belonging to this group. As might be expected, a considerable range of variation is shown by the extreme members of this very large series. In color they vary from almost black to a very pale gray; and in size from quite small to almost the size of a small house Rat. Considerable variation in structure, such as the length of tail and height of ear is also shown.

This group is extremely wide in its range and it may be safely said to occur wherever conditions are favorable to support higher life. It is found in timbered regions and on the plains, in areas of heavy snowfall or excessive rain and in the drier deserts. But wherever found it is the same general type, its habits only differing somewhat according to its choice of home.

S. A. Lottridge.

Photograph by West Va. University Experiment Station

WHITE-FOOTED MOUSE

Picture taken as it was scampering down the branches of a pine

LEMMING MOUSE

Synaptomys cooperi *Baird*

General Description.— Rather smaller than the True Lemming and superficially very much like the Meadow Mouse. Upper incisor with distinct groove near outer edge; head blunt; ears nearly hidden in fur; body moderately robust; tail very short; legs short; feet of normal proportions; general color reddish-brown above, plumbeous gray below. Pelage a trifle coarse.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{0-0}{0\ 0}$; Molars, $\frac{3-3}{3-3}=16$.

Pelage.— Adults: Sexes identical. *Summer.* General color of upper parts grizzled gray and yellowish-brown, lined with black; underparts, whitish; tail above, brown, below, whitish. *Winter.* Grayer and less reddish-brown. Young: Slate or grayish-brown according to age.

Measurements.— Total length, 5 inches; tail vertebrae, .75 inch; hind foot, .8 inch.

Range.— Eastern Massachusetts to Minnesota, south to North Carolina, Tennessee, Indiana and Iowa.

Food.— Stems of grasses, green vegetation, roots.

Related Species

Cooper's Lemming Mouse.— *Synaptomys cooperi* Baird. Typical animal of the above description. Eastern United States, Massachusetts to Minnesota, south to North Carolina, Tennessee, Indiana and Iowa.

Quebec Lemming Mouse.— *Synaptomys fatuus* Bangs. Smaller than Cooper's Lemming Mouse. New Brunswick, Quebec, Ontario.

Labrador Lemming Mouse.— *Synaptomys innuitus innuitus* (True). Grayish-brown above; beneath, gray; about size of Cooper's Lemming Mouse. Common to Labrador.

Dall's Lemming Mouse.— *Synaptomys dalli* Merriam. Size large; coloration above, raw umber mixed with black; beneath grayish-white. Valley of the Yukon, western Alaska.

The Lemming Mice are in appearance intermediate between the True Lemmings and the Meadow Mice. The characters outlined above are ample to separate this Mouse from either of these two groups. Some of the Lemming Mice range up into Arctic America, but most of the species are found in more temperate regions. Thirteen species and subspecies are known.

Lemming Mice may be distinguished from Meadow Mice by their very short tail and grooved front teeth; but the general appearance of the two animals is so similar that one is often mistaken for the other. Little is known of their habits. Generally speaking, the Lemming Mice are to be found in wet bogs, on the borders of lakes, or about muskeg ponds, although in Indiana they sometimes frequent stony pastures on hillsides. Cooper's Lemming Mouse is found from Massachusetts to Minnesota and south to North Carolina. It is fond of using the runways of Meadow Mice and as a consequence is often caught in them.

LONG-TAILED LEMMING MOUSE

Phenacomys longicaudus *True*

General Description.— Superficially very much like a long-tailed Meadow Mouse. Head fairly blunt; ears small and not very prominent; body of normal proportions; tail long, almost half total length; limbs of normal proportions; feet slender; general color, bright rusty brown mixed with black; below, white tinged with brown; pelage of moderate length.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{0-0}{0-0}$; Molars, $\frac{3-3}{3-3}=16$.

Pelage.— Adults: Sexes identical. Seasonal variation slight. Above, bright rusty brown mixed with black; underparts, white tinged with rusty brown; hairs on throat white to the roots, hairs of the rest of underparts plumbeous at base; tail uniform chocolate brown; feet brown. Young: Dark gray.

Measurements.— Total length, 6 inches; tail vertebrae, 2.4 inches; hind feet, .8 inch; ears, .2 inch.

Range.— Coast district of Oregon.

Food.— Vegetation and probably a few insects.

Related Species

Long-tailed Lemming Mouse.— *Phenacomys longicaudus* True. Typical animal as described above. Coastal Oregon.

Mountain Lemming Mouse.—*Phenacomys orophilus* Merriam. Tail short; above grayish-brown tinged with yellow, thickly sprinkled with black. Mountains of British Columbia and western United States south to Mt. Shasta.

Labrador False Vole.— *Phenacomys ungava ungava* Merriam. Smaller than the Long-tailed Lemming Mouse; face more yellow than rest of body; color pale yellowish cinnamon brown. Labrador.

The Long-tailed Lemming Mouse belongs to a group very closely related to the Common Meadow Mouse. For a long time naturalists classified them together and this fact gave rise to the name *Phenacomys,* which means False Mouse. The characters which separate the two are not superficial and can only be determined by careful examination. The best difference is the fact that the molar teeth of *Phenacomys* have two roots while those of the Meadow Mouse are quite rootless. The Long-tailed Lemming Mouse, however, may be recognized from the fact that it is a tree-loving rodent and lives in the Douglas fir. But the other species are not arboreal and consequently are very easily confused with the Meadow Mice. Eleven species and subspecies of this group of Lemming Mice are known.

TRUE LEMMING

Lemmus trimucronatus (*Richardson*)

General Description.— A heavy-bodied, very short-tailed Mouse of the Arctic regions. Nose blunt and hairy; form stout, compact; ears small, hidden in the fur; tail short, stout, densely haired, tipped with long hairs; legs short; fore feet large with long fossorial claws, thumb rudimentary with long flat claw; hind feet short, broad, with hairy soles and naked tubercles; fur of medium length and somewhat coarse; general color yellowish-brown.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{0-0}{0-0}$; Molars, $\frac{3-3}{3-3}=16$.

Pelage.— ADULTS: Sexes identical. Seasonal variation occurring but not especially different in winter. Head and fore part of back, mixed clove brown and yellowish-brown; below, bluish-gray mixed with yellowish-brown hairs; tail gray. YOUNG: Similar to adults but grayer.

Measurements.— Total length, 5 inches; tail vertebrae, .7 inch; hind foot, .9 inch.

Range.— Arctic regions of North America.

Food.— Green vegetation and roots.

RELATED SPECIES

True Lemming.— *Lemmus trimucronatus* (Richardson). Typical animal as described above. Arctic America.

Yellow Lemming.— *Lemmus helvolus* (Richardson). Size large; coloration brownish-yellow or rust color, mixed with black. Arctic America.

Black-footed Lemming.— *Lemmus nigripes* (True). Fore feet black above; upper parts uniform cinnamon-gray. Pribilof Islands, Alaska.

The Lemmings are a well differentiated group of thick-bodied Mice quite closely related to the common Meadow Mice of the temperate regions. From the Meadow Mice they may easily be told by their rather heavier bodies, very short tail and large fore feet. None of the True Lemmings comes south of the Arctic regions. There are but six species and subspecies. They do not change color in the winter, as do the False Lemmings.

The True Lemming is an inhabitant of the Hudson Bay region. It burrows extensively, and its holes seem to be connected in an endless labyrinth, mainly under the boulders between the shore and some shallow lagoons. The number of young is from four to six.

Another variety discovered by Richardson is somewhat larger and more yellowish in color. It has been described as a rusty black. Still another, the Black-footed Lemming, is marked as its name indicates by black on its fore feet. This rodent lives in the Pribilof Islands, off the coast of Alaska. They probably reached here originally partly by swimming or on floating ice, and this may have been the result of a migration for which some Arctic Lemmings are famous. A general movement of this nature is widespread and is probably caused by overcrowding and consequent scarcity of food. Dr. Coues says of such a migration: "Nothing can stop them; they proceed straight on in their course, urged by some restless impulse, swimming broad rivers and lakes and invading towns which may lie in their way."

Photograph by H. T. Middleton

DEER MICE

Climbing a telegraph pole

FALSE LEMMING

Dicrostonyx hudsonius (*Pallas*)

Other Names.— White Lemming, Snow Lemming, Pied Lemming, Hudson Bay Lemming.

General Description.— Similar in appearance to the True Lemming but with smaller head and less robust body. Nose blunt; ears almost covered in the fur; body moderately thick-set; tail and legs very short; four claws on front feet; two middle claws on fore feet becoming excessively enlarged in winter; general color ashy gray mixed with reddish and blackish; lower parts reddish; in winter everywhere pure white; hairs fairly long and soft.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{0-0}{0-0}$; Molars, $\frac{3-3}{3-3}=16$.

Pelage.— ADULTS: Sexes identical. *Summer.* Above, ash gray mixed with reddish and blackish-brown; lower parts reddish; a dark brown lateral line from sides of face and neck dividing the colors of upper and lower parts; grayish-black streak from nose to nape; sides of head gray; whiskers brown or white. *Winter.* Pure white everywhere. YOUNG: Slate color.

Measurements.— Total length, 5.5 inches; tail vertebrae, .6 inch; hind feet and claw, .8 inch; fore feet and claw, 1.2 inch, longest claw, .4 inch.

Range.— Arctic America from Labrador west.

Food.— Green vegetation, grass stems and roots.

RELATED SPECIES

False Lemming, or White Lemming.— *Dicrostonyx hudsonius hudsonius* (Pallas). Typical animal as described above. Eastern Arctic America.

Richardson's White Lemming.— *Dicrostonyx richardsoni* Merriam. Size large; third nail of fore foot larger than fourth. Hudson Bay region about Fort Churchill.

Alaska White Lemming— *Dicrostonyx nelsoni* Merriam. Size rather small; upper parts chestnut; feet white; winter pelage pure white. Arctic Alaska from Point Barrow.

The False Lemmings, while markedly resembling the True Lemmings, may be readily distinguished from them by reason of the enlarged claw on the front foot, and in winter by the white coloration. All of the False Lemmings turn white in winter and none of the True Lemmings do so. Six species of White Lemmings have been described, all to be found in some part of Arctic America.

The Hudson Bay Lemming has very small ears, hidden in the fur, and a tail so short that it can scarcely be seen. The pelage, which in

Photograph by the West Va. University Experiment Station

MEADOW MOUSE

The Meadow Mice are probably the most abundant small rodents in North America summer is brown or brownish gray with a black stripe down the back, becomes almost snow-white in winter.

The variety known as Nelson's Lemming occurs in Alaska. E. W. Nelson was able to take some of these Lemmings alive. He states that they were amusing, inoffensive little creatures and from the first allowed themselves to be handled without attempting to bite. "They would climb up into my hand and from it to my shoulder without a sign of haste or fear, but with odd curiosity, keep their noses continually sniffing and peered at everything with bright bead-like eyes. When eating they held their food in their fore paws."

Lemmings have the appearance of small Rats. They feed mainly on mosses, stalks and roots of grasses, and the tender shoots of birch, and in searching for food make long galleries under the snow. They make nests, usually of hair and rye grass; they have two broods a year; and produce four to six young at a birth. It is often stated that American Lemmings do not migrate as those of the Old World do; but Rae observed some as migrating northward near the mouth of the Coppermine River early in June, 1851. An account of this migration is given by him in the *Journal of the Linnaean Society* as follows: "I am not aware if it is generally known that the Lemmings of North America migrate much in the same manner as do those of Norway and Sweden. When traveling in June, 1851, southward from the Arctic Coast along the west bank of Coppermine River, and north of the Arctic Circle, we met thousands of these Lemmings speeding northward, and as the ice on some of the smaller streams had broken up, it was amusing to see these little creatures running backward and forward along the banks looking for a smooth place with slow current at which to swim across. Having found this, they at once jumped in, swam very fast, and on reaching the opposite side gave themselves a good shake, as a dog would, and continued their journey as if nothing had happened."

One species of the Hudson Bay Lemming is found in abundance around Fort Churchill and on the Barren Grounds. These Lemmings frequent the gravelly ridges, the remains of old sea-beaches, bordering the bay. Mr. Edward A. Preble who, with his brother, captured about 120 specimens in 1900, states that they make burrows but no runways. The only food found in the burrows was a few leaves of the bearberry. Each burrow seemed to be tenanted by only a single individual, except in the case of a mother Lemming and young. The breeding season seemed to be nearly over in August, and every litter found consisted of three. The young "were very readily tamed and took rolled oats and crumbs of bread within a few hours of their capture. They sat on their haunches and held their food in their fore feet like Squirrels. The old ones fought viciously when captured, and their sharp incisors and strong jaws made them somewhat formidable."

COMMON MEADOW MOUSE

Microtus pennsylvanicus (*Ord*)

Other Names.— Eastern Vole, Field Vole, Field Mouse.

General Description.—A medium-sized Mouse, short-tailed, with body rather heavier than that of the common House Mouse. Head large and blunt; ears low and almost hidden in the fur; body thick-set; tail short, about twice as long as hind foot; fur long, overlaid with coarse hairs; legs short; soles of feet naked and having six plantar tubercles; molar teeth with a great number of sharp angles in the enamel, thus furnishing many sharp cutting edges; mammae eight; general color dusky gray or brownish.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{0-0}{0-0}$; Molars, $\frac{3-3}{3-3}=16$.

Pelage.— Adults: Sexes identical. *Summer.* Upper parts, dull chestnut-brown varying to bright yellowish-chestnut, darkened along back with coarse black hairs; under parts, dusky gray or tinged with cinnamon; feet brownish; tail dusky above, slightly paler below. *Winter.* Colors duller and uniformly grayer throughout; tail indistinctly bicolor. Young: Uniform dark slate-gray.

Measurements.— Total length, 6.7 inches; tail vertebrae, nearly 2 inches; hind foot, .8 inch.

Range.— Eastern United States and westward to Dakota and Nebraska.

Food.— Omnivorous to a considerable degree, but principal articles of diet, grass, grain and green vegetation.

Remarks.— Meadow Mice are found in so many habitats, and are so susceptible to environmental conditions, that they have become differentiated in many different details such as color, size, character of pelage, length of tail, number of little pads on the feet, etc. There are at least 76 species and subspecies in this country. Only a few may be listed here.

RELATED SPECIES

Common Meadow Mouse, or Eastern Vole.—*Microtus pennsylvanicus pennsylvanicus* (Ord). Typical animal as described above. Eastern United States westward to Dakota and Nebraska.

Drummond Vole.—*Microtus drummondii* (Audubon and Bachman). Much smaller, slenderer and paler than the Eastern Vole. From Hudson Bay to west slope of the Rocky Mountains and Alaska, and from northern edge of United States north to Fort Anderson, Mackenzie.

Mountain Vole.—*Microtus montanus montanus* (Peale). Size moderate; tail longer than that of Eastern Vole; color yellowish-brown mixed with black. Northeastern California, eastern Oregon, northern Utah and Nevada.

Dwarf Vole.—*Microtus nanus nanus* (Merriam). Size small; ears small; color, pale grizzled brown mixed with black.

California Vole.—*Microtus californicus californicus* (Peale). Tail twice as long as hind foot; color, pale yellowish-brown mixed with black. California west of Colorado desert, and the Sierra Nevada from San Diego county, California, to Rogue River, Oregon.

Townsend Vole.—*Microtus townsendii* (Bachman). Size very large; tail long; colors dark. Low country west of Cascades from Port Moody, British Columbia, south to Willamette Valley, Oregon.

Yellow-cheeked Vole.—*Microtus xanthognathus* (Leach). Size large; ears large; tail shorter than head; above dark brown and black; blackish-brown stripe on nose between two reddish-brown stripes. Northwestern Canada and Alaska from central Alberta north to Arctic coast and west to central Alaska.

Arctic Vole.—*Microtus macfarlani* Merriam. Size medium; tail short; color, dull yellow-brown and black. Tundra region of Arctic America east of Mackenzie river.

Richardson's Vole.—*Microtus richardsoni richardsoni* (DeKay). Probably the largest of American Voles, total length up to 9 inches; tail about as long as head; feet large; mammae eight; color dark brown. Rocky Mountain region of Alberta, Canada.

Prairie Vole.—*Microtus haydenii* (Baird). Medium size, soles thickly haired; tubercles on soles five in number; tail and ears short; grayish yellow-brown mixed with black above; mammae six. Plains region of western South Dakota, Nebraska, Kansas, eastern Colorado, Wyoming and southern Montana.

Oregon Vole.—*Microtus oregoni oregoni* (Bachman). Size very small; tail long; ears prominent; fur short and glossy; mammae eight. Pacific coast region from northern California to Puget Sound.

Pine Vole.—*Pitymys pinetorum pinetorum* (LeConte). Size small, soles hairy with five tubercles; mammae four; pelage short, close and glossy; ears short; tail short; above, russet, beneath, plumbeous washed with russet. Georgia and the Carolinas.

Pallid Vole.—*Lagurus pallidus* (Merriam). Size small; tubercles on soles of feet five in number; eight mammae; tail very short; ears well haired; above pale buffy gray mixed with black; beneath white. Prairies of western North Dakota, Montana, and north to Calgary, Alberta.

The Meadow Mice are probably the most abundant small rodents in North America, not only as regards individuals but also as regards number of species. There are no less than seventy-six species and subspecies north of the Rio Grande, not to mention a few that are found south of this boundary. This large number of different varieties is due to the great diversity of local surroundings in which Meadow Mice live. Being of a vigorous stock, they have pushed into almost every available economic niche.

In fact, the most remarkable thing about these troublesome little rodents, the Field Mice, as the farmers generally call them, is their ability to adapt themselves to the most widely differing environments. No matter, whether above the timber line on some snowclad Alaskan peak, or in the pine forests of Georgia; whether on the arid sand flats of the Painted Desert, or in the well-watered meadows of Pennsylvania—everywhere they seem to enjoy life. Under one set of conditions as under another, they present an equally sleek and well-fed appearance. Naturally the effect of environment is seen in the peculiarities of certain species, as, for instance, the brightening in color due to the effect of red soil.

"The vast range of this species has been noted," says David E. Lantz in "An Economic Study of Field Mice." "This Mouse has its natural habitat in moist meadows and grassy borders of swamps, but it habitually extends its range into neighboring cultivated fields, waste lands, and open spaces on the border of timber lands. Wherever it occurs, it is normally the most abundant rodent. Nearly all meadows are full of the animals.

"In swamps Meadow Mice nest in burrows in dry tussocks or in bunches of grass above the surface of the moist ground. The nests are composed of grass or fibers of weeds made into balls, loose and of coarser materials outside, but compact and of finer stuff within, each having a small opening on the side near the bottom. From this opening two or more trails diverge, one usually leading into an underground tunnel which opens at some distance from the nest.

Nests intended to receive the young are lined with the softest of accessible materials.

"The Meadow Mouse never lives in barns or outbuildings. Its nearest approach to human habitations is the stackyard or piles of wood or boards left on the edge of orchards or fields near houses. It is especially noted for long winter excursions from its summer abode, hiding its movements under cover of deep snow. The journeys of the animals are not suspected until the snow disappears, when the trails can be traced to great distances. They reach wheat, rye, clover and timothy fields and often extend into orchards, nurseries, lawns and gardens, all of which are injured by the animals. Haystacks or shocks of corn and other grain are sure to suffer if left out over winter."

Field Mice of the genus *Microtus* have stout bodies, blunt rounded muzzles, small eyes, and short ears — often completely concealed in the fur. The tail is short and hairy; the soles of the feet are naked or clothed with short hairs, and have five or six foot pads. The incisors are broad and not grooved.

While the food habits of the various species of short-tailed Field Mice are remarkably similar, their breeding and general habits differ greatly. The variety of habitats is most striking. Some species prefer high ground, while others live in low, moist places. Occasionally the same species inhabits both sorts of localities. Some species live in forests, others in the open prairies. Some burrow under the ground like Moles, while others make smooth paths or trails upon its surface. Except in cold weather, nearly all species can temporarily adapt themselves to moist surroundings; but a few seem to be almost as aquatic as the nearly-allied Musk-rat.

The nests of Field Mice are compact bunches or globes, composed of grass blades and other dry vegetable fibers. They are placed in depressions in the ground, in shallow burrows, or supported on grass stems above the ground. In brush piles they have been found nearly a foot above the ground. Sometimes they are placed under flat stones or logs or under shocks of grain. The structures are so slight that a day's sunshine will dry them out after a storm, and

Photograph by the American Museum of Natural History

MEADOW MOUSE

A well-mounted specimen showing not only characteristic attitude, but also distinctive markings of the fur

yet they are so compact that the animals pass the coldest weather snugly housed in them under the snow. Trails, often of great length and worn smooth by constant use, lead to neighboring feeding grounds.

While most surface nests are for shelter only, sometimes the young, especially of swamp species, are produced in them. However, the young of most kinds are born in underground nests and are rarely seen unless uncovered by accident. They are at first hairless and blind.

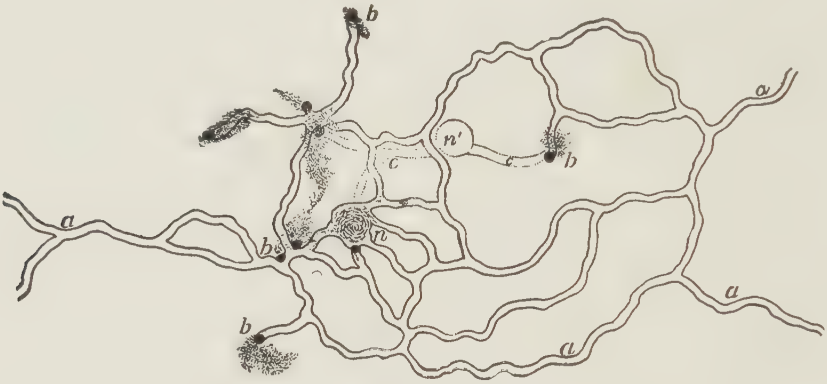
"The common Meadow Mouse of the United States is one of the most prolific of our species," says Lantz. "Estimating the normal increase at six young, with four litters in a season, and assuming that there were no checks upon the increase, the results are appalling. A single pair and their progeny in five seasons would amount to nearly 1,000,000 individuals. This calculation is under mark, since it is based on the assumption that the young do not breed until about a year old. The animals, however, mature very rapidly and the spring young undoubtedly breed in the fall of the same year.

"In summer the principal food of these Mice is green vegetation and unripe seeds of grain and grasses. As the season advances, ripe grain and seeds take the place of the immature; and in winter bulbous and other roots are in part substituted for stems and leaves. When convenient, and green vegetation is lacking, the bark of trees and shrubs becomes a staple food. It is mainly in winter that the apple orchards and young forest trees suffer from attacks of Mice.

"The quantity of green vegetation eaten by a single adult Field Mouse in the course of a year has been calculated at from twenty-four to thirty-six pounds. When one considers in connection with this estimate the great numbers of these animals in our meadows, swamps, and forests, the total quantity of food consumed by them appears so enormous as apparently to exceed the productive capacity of the soil. A thousand Meadow Mice in a meadow would require at least twelve tons of grass or other vegetation to maintain them for a year."

They are not especially partial to seeds, but flesh in any form is acceptable to them. They do not usually lay up food for the winter; but one Alaskan species has been seen to store roots. Certain peculiarities of habits are common to most of the species. "None are known to hibernate," says Vernon Bailey, "but in the north they have snug winter homes under the snow, where they move about freely in numberless tunnels. They burrow in the ground, and are famous for their little roads or smooth trails which run through the grass from burrow to burrow or away to their feeding grounds."

There seems to be no definite breeding season; nests with young in them have been found at all seasons of the year. Four to eight at a birth is the usual number. As the period of gestation is only about twenty days, and in temperate latitudes from four to six litters a year are produced, it will be seen that the annual increase must be enormous. The economic status of the Meadow Mouse is indeed a very important one; it has been carefully estimated that the Mice of the genus *Microtus* alone cause an average annual damage to the American farmer of at least $3,000,000. As Bailey says: "Too small and too numerous to be successfully destroyed



From a drawing by the U. S. Biological Survey

MEADOW MOUSE RUNWAY

An ingenious arrangement of branching tunnels made by the little animal both in search of food, and to provide an easy means of escape

by traps, guns, or poison, they prove one of the most difficult enemies with which the farmer has to contend. The work of a few animals is insignificant, but the work of millions makes heavy inroads on growing crops. In shocks of corn and wheat left for a long time the grain is often completely devoured. Even stacks of hay are often found in spring with the lower parts cut to chaff and filled with the nests of meadow mice." When the snow melts in the spring, trees and shrubs are found stripped of their bark for a wide space near the ground, and the marks of tiny teeth remaining in the hard wood show what animal has been at work. Sometimes apple trees ten to twelve inches in diameter are completely girdled.

Various protective measures have been adopted and suggested. Wire netting and tin cylinders placed around the bases of the trees are expensive, but they seem to give the best results. But obviously the greatest destruction of these pests should be wrought by their natural enemies, the hawks, owls, weasels, foxes, coyotes and minks, and if these become few, then the protection of other such enemies becomes doubly important, if we are to escape such devastating hordes of Voles as have swept over Europe.

Owing to their peculiar habits *Pine Mice* are not so well known as are Meadow Mice. Their natural habitat is the forest, although they are by no means restricted to pine woods or forested areas. While often inhabiting pine woods and the edges of adjacent fields, they live also in forests and copses of deciduous trees, usually on uplands.

The life of the Pine Mouse is largely spent in underground tunnels, which so closely resemble those of the Mole that generally they are mistaken for the work of that animal. The ridges of loose soil over the tunnel are exactly like those thrown up by the Mole, but the inner diameter of Mouse tunnels is less. Some of these burrows are utilized as nesting places. Nests are built also at the surface of the ground, under fallen logs, brush heaps, flat stones, fences, or other shelter. The number of young at birth evidently averages less than is usual in this family.

From their homes in woods and thickets Pine Mice invade fields, orchards, nurseries, dooryards, and gardens, passing always through underground runways. Living in concealment, neither their presence nor the injury they inflict is suspected until the latter is past remedy. Bulbs, planted hopefully in autumn, appear not at all in the spring, or only in the shape of sickly plants, whose life substance has been gnawed away. Nursery and orchard trees here and there put forth no leaves, and an examination of the roots discloses the nature of the damage.

Commenting further on their depredations, David E. Lantz, says: "Potatoes, sweet potatoes, carrots, beets and other vegetables are eaten by Pine Mice, both while growing and when stored in pits or lying in piles in the field or garden. Potatoes partly matured or left long in the ground after maturity are eaten, and the injury is attributed to Moles, because tunnels supposed to be the work of Moles lead to the place of damage. I have investigated numerous cases of such injury and have invariably found either that the tunnels were made by Pine Mice, or, if Mole tunnels, that they were frequented by Mice. Traps set in the tunnels at the potato hills captured Pine Mice, and the starchy material found in the stomachs of those caught proved that they, and not Moles, had been eating the potatoes."

The *Oregon Vole* is a rather small-sized Mouse of the Pacific Coast region ranging from Northern California to Puget Sound. It is found on dry, open ground, under cover of grass and low vegetation, and under logs in the open redwood forest of California.

The *Long-tailed Vole* is an inhabitant of the Yukon region found in various environments. Mr. Wilfred H. Osgood records that "at Glacier and Bennett they were secured on dry, rocky hillsides; at Lake Lebarge, they were taken in the kitchen of a log cabin; at Rink Rapids in an open, sandy place; and near Charlie Village on the side of a cut bank, where they had made burrows and runways among the exposed roots of trees."

Drummond's Vole is a species occurring from Hudson Bay to the west slope of the Rocky Mountains and Alaska. Mr. Edward A. Preble found it abundant in many parts of the Athabaska-Mackenzie region, where it did considerable damage about the trading posts, entering the houses freely. Another interesting species of this region is the *Yellow-cheeked Vole,* a large Mouse whose burrows were evidently quite deep, there being nearly a bushel of dirt at the entrance to a single burrow. Preble captured a female which would have borne eleven young ones. This species is quite active during the day.

RED-BACKED MOUSE

Evotomys gapperi (*Vigors*)

Other Name.— Red-backed Vole.

General Description.— A small, dark-colored Mouse, reddish along the back. Nose somewhat pointed; ears fairly large; body of normal proportions, neither slim nor thick-set; tail short, only about one-quarter total length; legs short; general color, chestnut along back, with buffy sides and underparts gray; hair rather long and quite soft.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{0-0}{0-0}$; Molars, $\frac{3-3}{3-3}=16$.

Pelage.— Adults: Sexes identical. *Summer.* A broad dorsal stripe extending from neck to tail, chestnut mixed with black; sides buffy ochraceous; underparts pale buff with the hairs dark plumbeous at base; feet silvery-gray; tail above, brownish, beneath, grayish-buff, tip black. *Winter.* Colors paler everywhere. Young: Slaty-gray and lacking a pronounced dorsal stripe.

Measurements.— Total length, 5.2 inches; tail vertebrae, 1.4 inches; hind foot, .7 inch.

Range.— Massachusetts, New Jersey and Pennsylvania northward, and from Atlantic Coast westward to Rocky Mountains in Canada.

Food.—Inclined to be omnivorous but feeding largely on seeds, berries, roots and bark of trees and shrubs.

Remarks.— Twenty-three species and subspecies are known, but all conform to the general type described above.

Related Species

Red-backed Vole.— *Evotomys gapperi gapperi* (Vigors). Typical animal as described above. Massachusetts, New Jersey and Pennsylvania northward, and from Atlantic Coast westward to the Rocky Mountains in Canada.

Rhoads's Red-backed Vole.— *Evotomys gapperi saturatus* Rhoads. Larger and longer tailed. Blue Mountains of Oregon, mountains of northern Idaho and northward into British Columbia to Caribou Lake.

Great Plains Red-backed Vole.— *Evotomys gapperi loringi* Bailey. Size very small, colors bright. Timbered valleys along edge of plains in Minnesota and eastern Dakotas.

Dawson's Red-backed Vole, or Arctic Red-backed Vole.— *Evotomys dawsoni dawsoni* Merriam. Size large; tail short; bright rusty red above. Finlayson River and Fort Laird west to Yakutat and Juneau, and north along the coast to Prince William Sound.

Labrador Red-backed Vole.— *Evotomys proteus* Bangs. Size large; sepia above; below, light smoke-gray; total length nearly seven inches. Labrador.

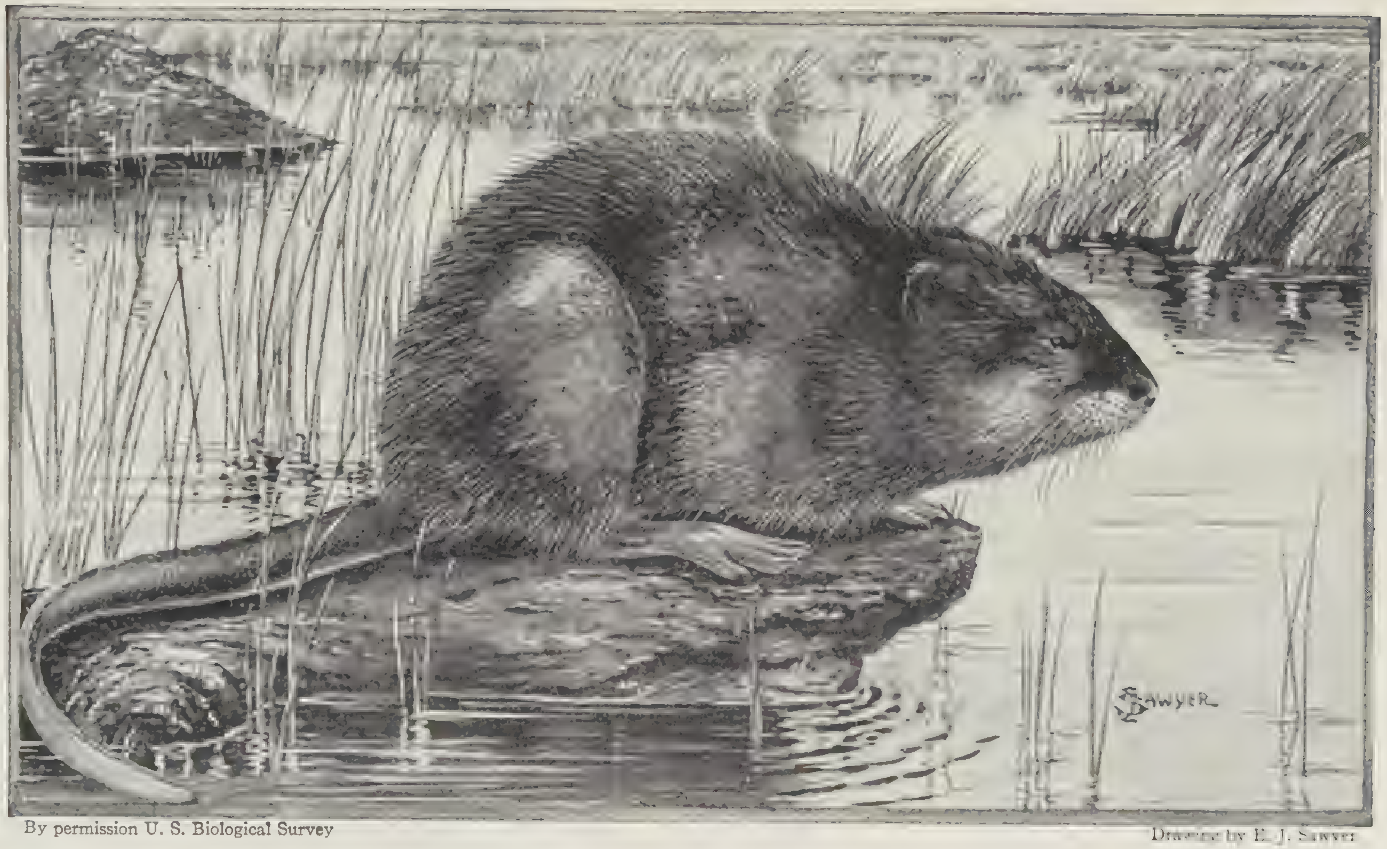
The Red-backed Vole may be easily distinguished, in the case of adult animals, from the more common Meadow Mouse by the broad, chestnut-colored stripe extending along its back the entire length. It is also a smaller animal, with softer quality of fur and larger ears. However, it is a very close relative of the Meadow Mice. This group is of northern distribution, most of the species being found only in the mountains or in high altitudes.

In many regions the Red-backed Mouse is the most abundant of mammals. It is fond of mossy places, and is captured more frequently under decayed logs than in any other situation.

Gapper's Red-backed Mouse, of which there are more than half a dozen varieties, is the species most common in the Eastern States; from Pennsylvania and New Jersey northward to Canada. In the Hudson Bay region, around Fort Churchill, Mr. Edward A. Preble found mossy spruce woods to be its favorite habitat, although he trapped it also in mixed woods, and occasionally in willow thickets in swamps.

Rhoads's Red-backed Vole is a larger and longer-tailed variety. It lives in the sphagnum bogs of the Northwest, which are frozen for several inches below the surface in the winter; hence it must subsist on the food it has stored in its underground galleries. It is a hardy and an active animal.

The *Dawson Red-backed Mouse* is a handsome species ranging from northwest Territory west to Juneau. About Great Bear and Great Slave lakes, Preble found some of these animals "living among the rocks on the semi-barren tracts near the shore and feeding largely on the cranberries." Mr. Wilfred H. Osgood, who traversed the whole length of the Yukon river in 1899, says: "Red-backed Mice are by far the most abundant mammals in the Yukon region. Specimens were trapped in all sorts of localities; along cold streams, under logs, in heavy moss, in *Microtus* runways, and among rocks. We occasionally saw them during the day, and often heard them rustling the dead leaves on the ground about us as we lay in our blankets at night. They are the vermin of the miner's larder, and are always to be found about log cabins."



By permission U. S. Biological Survey

Drawing by E. J. Sawyer

COMMON MUSK-RAT

In general structure this rodent is a true Rat; but in shape and habits it may be called the little brother of the Beaver

MUSK-RAT

Ondatra (or Fiber) zibethica (*Linnaeus*)

Other Name.— Musquash.

General Description.— A large rat-like rodent with long, naked, vertically compressed tail. Head broad and blunt; ears almost hidden in long fur; body thickset, heavy; tail long, about one-half total length; legs short; hind feet specialized, long, with toes partly webbed; tail much deeper than wide, almost naked and scaly, with scattered long hairs; pelage of two coats, a dense soft underfur and long outer coat of hard glistening hairs.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{0-0}{0-0}$; Molars, $\frac{3-3}{3-3}=16$.

Pelage.— Adults: Sexes identical. Seasonal variation very slight. General color dark chestnut brown above; underparts brownish-white; underfur everywhere slaty-black; throat whitish; chin with brown spot; feet brown; tail blackish-brown; individuals vary from this pattern to much darker. Young: Slaty-gray.

Measurements.— Total length, 21 inches; tail vertebrae, 10 inches; hind foot, 3.5 inches. Weight, 2 pounds, 4 ounces.

Range.— Southeastern Canada, northeastern and east central United States.

Food.— Quite omnivorous; besides many types of vegetation such as stalks and roots of flags, lilies and reeds, considerable animal food is eaten, mainly clams, fish and insects.

Remarks.— The Musk-rat is in reality only a highly specialized, enlarged Vole, and this relationship is shown in a number of characters. They are widely spread over North America from northern Mexico to the Arctic Coast, and have become differentiated into fourteen species and subspecies, of which only a few need be cited below.

RELATED SPECIES

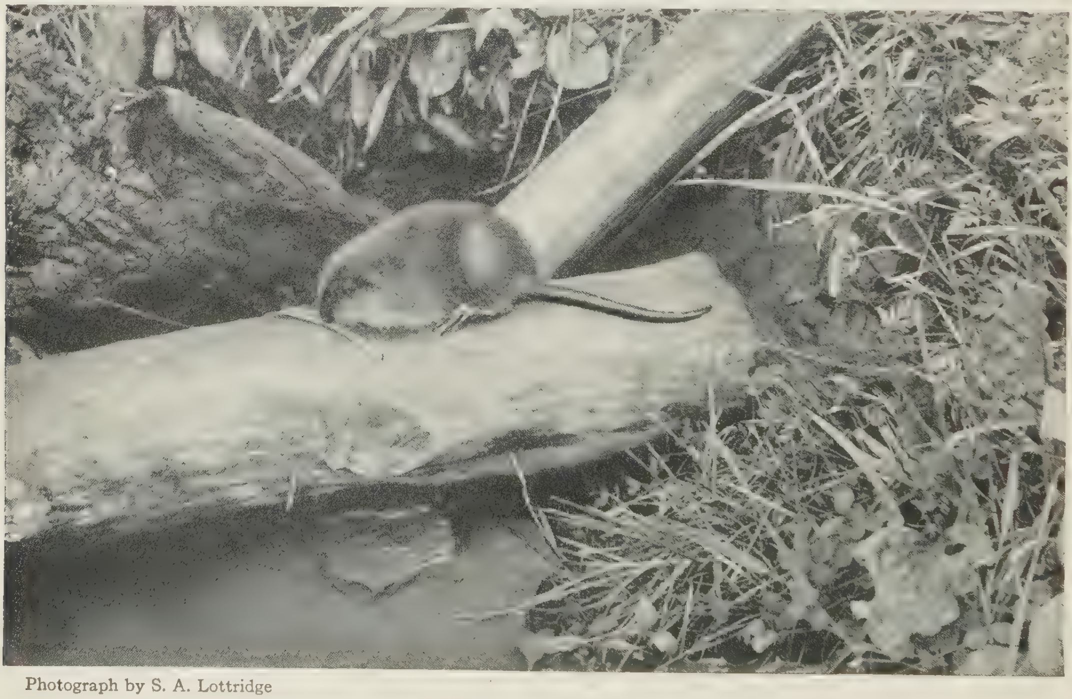
Musk-rat.— *Ondatra zibethica zibethica* (Linnaeus). Typical animal as described above. From New Brunswick and Quebec west to Minnesota, south to northern Georgia, Arkansas, and south along Atlantic seaboard to Delaware Bay.

Large-toothed Musk-rat.— *Ondatra zibethica macrodon* (Merriam). Color darker and richer; teeth larger than common Musk-rat. Middle Atlantic Coast region of the United States.

Labrador Musk-rat.— *Ondatra ziebethica aquilonia* (Bangs). Smaller and blacker than the common Musk-rat. Labrador.

Pallid Musk-rat.— *Ondatra zibethica pallida* (Mearns). About two-thirds as large as common Musk-rat; coloration paler. Colorada River Valley, California, and Arizona, east to the Rio Grande Valley in New Mexico.

Oregon Musk-rat.— *Ondatra zibethica occipitalis* (Elliot). Largest of the Musk-rats; coloration dark. Northern Willamette Valley and coast of Oregon.



Photograph by S. A. Lottridge

YOUNG MUSK-RAT

Everything is food that comes to the Musk-rat's table

A few years ago a country boy was crawling quietly along through the tall grass and low bushes bordering the edge of a mill pond. As he peered over the tops of the grass he saw just above the surface of the water a brown rat-like head and behind it a series of little rippling waves. The boy crouched and watched with all his eyes. Splash! The animal had dived, only to reappear in a few minutes, upon a shelving rock with a fresh-water "clam" in its mouth. It opened the shell and ate its contents with seeming relish. When its meat course was finished it nosed along the bank for a rod or two, and, finding a plant to its taste, dug into its root with a few slashing strokes of its strong fore-legs, and ate its vegetable course with quite as evident gusto.

"My land!" breathed the boy to himself, "what a whopper of a Musk-rat!"

On another magic day the boy was fortunate enough to see a second Musk-rat swimming back and forth near the bank followed by four smaller copies of herself. Slowly the light faded and he could see them no more; but, as he stood up and turned to go home, he heard the slap of the Rat's tail on the water, warning others of her kind that danger threatened; then slap after slap around the pond as others heard the alarm and passed it on.

A few days later the boy set traps at the mouth of the Musk-rats' burrows in the bank of the pond. They were rather small steel traps, and he sank them into the mud and also in the shallow water near the shore. Then he impaled a small carrot on one end of a slender stick and pushed the other into the ground at such an angle that the carrot came just above the pan of the trap, and high above it so that the Rat would have to stand upright in order to reach the tempting morsel. Oftentimes he caught his Musk-rat in this manner, although sometimes he found only the lower part of a leg in the trap. In its struggle to escape the Musk-rat had twisted or gnawed off its own leg.

Photograph by Dr. R. W. Shufeldt

MUSK-RAT FEEDING

A rodent that is more at home in water than on land. Large numbers are killed for the sake of their fur

If he had been an Indian boy along the Yukon River of Alaska, a Creole boy in Louisiana, the son of a lumberman in Maine, or a gold miner in the Rocky Mountains, this boy's experience would have been much the same; for the Musquash — as the Musk-rat is sometimes called — is found practically all over North America as far south as the Mexican boundary. No single species, however, is so widespread. The common eastern form, with its subspecies covers most of the entire range. Of two other important species, one is found in Labrador and the other in southern Louisiana and Mississippi. Some of the subspecies are much restricted in range. The *Large-toothed Musk-rat* is confined to the region on and near the coast of Delaware, Maryland, Virginia and North Carolina. The *Oregon Musk-rat* is limited to the northwestern coast region of Oregon and the southwestern part of Washington.

In general structure and in the character of the teeth, the Musk-rat is simply a great Mouse; but in shape and habits it is a small edition of the Beaver. In fact, Linnaeus put it into the same family genus with the latter. However, it is much smaller than the Beaver, and the tail is entirely different, that of the Beaver being very broad and flattened laterally, while that of the Musk-rat is narrow and flattened vertically. This flattening enables the Musk-rat to use it both as rudder and propeller. The hind feet are slightly webbed and assist in swimming.

Anyone who has visited marshy ponds and sluggish shallow streams has noticed the conical piles of mud and vegetable matter which extend from a foot to three feet above the surface of the water. These are Musk-rat houses, similar to, but smaller than, Beaver houses. The method of building these is rather unusual. A pile of mud mixed with plant stalks is brought together in a place where the water is about two feet deep. When the pile is sufficiently large, the Musk-rat makes a tunnel from the bottom upward, and hollows out a chamber just below the upper surface of the dome, or through it in some cases, so that only a few plant stalks stick out above. More mud and stalks are placed on top of the chamber, as the roof sinks, until the whole house is firm. The single main room may be a foot or more in diameter and sufficiently high to enable the owners to move about freely. Sometimes there are two main chambers, each with its own entrance, but they are probably occupied by different families. These houses are chiefly used in winter. Work of repairing old houses and erecting new ones begins in early summer, in order that they may be snug and shipshape when ice begins to form.

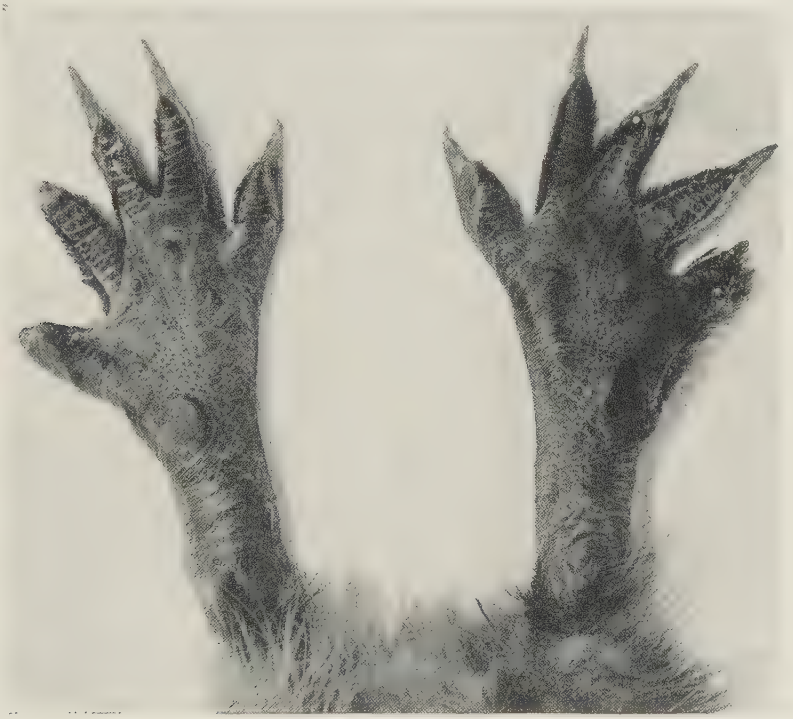
In summer an elaborate system of tunnels and chambers is used for refuge and for breeding. The mouths of these tunnels start well under the surface of the water and lead upward gradu-

Photograph by William Brewster (U. S. Biological Survey)

MUSK-RAT HOUSE

These resemble Beaver houses, but are smaller. An elaborate system of tunnels is within

ally to the chambers above water level, and often beneath the roots of trees. Small ventilation holes connect these rooms with the ground surface. Sometimes channels extend from the burrow entrance out into the deeper water, so that the Musk-rat is more secure as it approaches its home. Such channels are very prominent when the water in a pond dries up. Short tunnels ending in a chamber are sometimes made at intervals along the edge of a pond, to be used as retreats from danger when distant from home.



Photograph by the U. S. Biological Survey

MUSK-RAT FEET

The partially webbed structure of the hind feet of a Musk-rat aids it greatly in swimming

The Musk-rat believes in "safety first," for it avoids the attacks of many of its land enemies — such as Foxes — by building little islands or rafts of sticks, cattails and other plant stalks, on which it sits when eating. An enemy must come from the air or water to be dangerous. From the former it escapes by slipping quickly into the water. From the latter there is little chance of getting away. These rafts are kept stationary by being built around cattails or other plants growing in such places. In winter, ice does not cover these rafts completely, but snow soon roofs them over, and they serve as breathing holes when the Musk-rats are swimming under the ice in search of food, for they do not hibernate to any extent.

Everything is food that comes to the Musk-rat's table. Roots, stems, leaves of various water and swamp plants furnish the larger part of its bill-of-fare, while heaps of fresh-water mussel-shells (clams), at convenient landing places along the water's edge, testify to its fondness for flesh. Fish, frogs and other aquatic animals also form part of its diet.

When the snow and ice have melted and the warm spring rains have covered the land with the tender green of awakening vegetation, the Musk-rats mate, and savage fights may take place for the possession of a desired female. The four to twelve young are born in early May in the latitude of the Eastern States, and are blind and helpless, but in about three weeks have grown so rapidly that they can nearly care for themselves. This is necessary, for a second and even a third litter may follow them during the summer. In some localities four or five litters are said to be produced in one breeding season. By the end of the summer the young of the first lot are able to raise families of their own.

It is fortunate for them that Musk-rats are so prolific. Otherwise, they could hardly hold their own against their many enemies. To live a long life a Musk-rat must be ever on the alert. Some of the larger hawks and owls attack it from the air; wolves, foxes, lynxes, weasels, wolverines and many other animals prey upon it when it ventures on land; otters and mink are able to follow it in the water; and the bigger members of the pike family may seize it from below. The mink, however, is the worst of these, for it can follow the Musk-rat into its home. Like the Beaver, the Musk-rat is most susceptible to attacks from its land enemies when it goes on voyages of discovery from one body of water to another, as it often does in late fall. It is no coward and will fight to the death. It has been known to attack even a man when cornered far from a place of refuge.

To see the Beaver at its work one must usually go far from civilization; but the Musk-rat is at home in any small pond, bit of swamp, or deep brook within a few rods of one's house. A little quiet watching in the late afternoon will enable any village dweller to become rather intimately acquainted with this hardy and interesting neighbor.

Many may not know the Musk-rat so well in life, as after death. Then it comes into closer contact, as its dense under hair-covering makes it of value for fur. Several million skins are taken annually, and, after being dyed, are sold under such names as " electric seal ", or " Hudson seal."

The damage done by the Musk-rat is very slight. Sometimes it tunnels into dams and dikes and weakens them. In ornamental ponds it occasionally eats the roots and stems of water-lilies and other aquatic plants.

J. M. JOHNSON.

ROUND-TAILED MUSK-RAT

Neofiber alleni *True*

General Description.— A large, rat-like rodent much resembling the Musk-rat, but having a round tail. Size smaller than latter; head rather blunt; ears inconspicuous; body somewhat robust; tail long, nearly half total length, round, tapering gradually to tip; legs of moderate length; feet normal; toes not bent laterally at angle with the sole; soles naked, narrow, smooth, with five tubercles; conspicuous side glands present; general color rufous, lined with black; below white tinged with rufous.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{0-0}{0-0}$; Molars, $\frac{3-3}{3-3}=16$.

Pelage.— ADULTS: Sexes identical, seasonal variation inconspicuous. Pelage long, above rufous lined with black, the hairs with lead colored bases; head darker; hairs back of shoulders white at base; underparts light rufous with bases of hairs lead color; chin, throat, inside of legs, whitish or tinged with rufous; tail and feet dark brown. YOUNG: Blueish-gray on back; pale plumbeous beneath.

Measurements.— Total length, 13 inches; tail vertebrae, 5 inches; hind foot, 1.5 inches.

Range.— Eastern and central Florida.

Food.— Green vegetation, roots and some animal food.

Remarks.— There is only the one species. This animal appears to be somewhat intermediate between the little Meadow Mice and the more highly specialized Musk-rat, and is known only from a very limited range.

While called a Musk-rat, this less familiar animal occupies a group by itself, intermediate between the smaller Mice and its big cousin the common Musk-rat. It is very large for a Mouse, but small for a Musk-rat, since it is slightly over one-half as long as the latter. It is at home in both the fresh and salt-water ponds, and marshes of Eastern Florida. A large oval nest, resembling the common Musk-rat's, is built in water, and projects above the surface. Sometimes nests are built in the mangroves or in hollow stumps.

It also constructs platforms on which it sits while feeding. The food consists largely of grasses and other vegetable matter, although it does not disdain clams, and other marine forms that can be easily captured.

Many of its habits are similar to those of the common Musk-rat. It is a quick, alert animal, though perhaps not so industrious as its Northern cousin, as the warmer climate naturally leads to sluggishness, and it does not have to build such snug retreats against the approach of winter. It raises large and frequent families, whose members are much sought after, by such unwelcome guests as hawks, owls, foxes and the larger fish. The young that escape quickly attain maturity in the warm climate.

THE FAMILY OF POCKET RATS

(*Heteromyidæ*)

POCKET Rats are placed in a separate family because of well-defined variations from other Rats, the chief difference being indicated by the name. This is an interesting group of small rodents characterized, like the Pocket Gophers, by cheek pouches which are used for carrying food. They are the only North American animals, excepting the Gophers and the Jumping Mice, which have these pockets. They include the Pocket Mice, which are usually plains-loving animals, and the Pocket, or Kangaroo Rats, characterized by enormously developed hind legs. These rodents have narrow incisor teeth, rootless molars, and very large mastoids. Their hind feet are long, and they have either four or five toes. The pelage is generally soft, but in a few species the finer hairs are mixed with spiny bristles. Although a numerous and widely scattered family they are not popularly known, or even distinguished from common forms.

POCKET MOUSE

Perognathus fasciatus *Wied*

General Description.— A small Mouse with a large head, external cheek pouches, and rather a long tail. Head broad; eyes fairly large; ears medium size; hind legs elongate; tail well-haired and with a tuft of longer hair at the tip; pelage rather long, soft and glossy. Strictly nocturnal, an inhabitant of the open plains.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{1-1}{1-1}$; Molars, $\frac{3-3}{3-3}=20$.

Pelage.— ADULTS: Sexes identical. Seasonal variation slight. Above, olive-gray tinged with pale fulvous and lined with black; pale fulvous lateral stripe; feet and underparts white; two light yellow patches on ears and a larger patch behind ears; tail paler below than above. YOUNG: Lacking the yellow and black of the adult pelage.

Measurements.— Total length, 5.5 inches; tail vertebrae, 2.5 inches; hind foot, .7 inch.

Range.— Plains of eastern Montana and Wyoming, eastward into North and South Dakota.

Food.— Seeds, grain and other vegetable matter.

Remarks.— Considerable variation is found in color, size and character of pelage, some of the Pocket Mice having well developed spines among the softer hairs of the back. There are some 50 species and subspecies ranging north of the Rio Grande.

RELATED SPECIES

Great Plains Pocket Mouse.— *Perognathus fasciatus fasciatus* Wied. Typical animal of the above description. Montana, Wyoming, North and South Dakota.

Yellow Pocket Mouse.— *Perognathus flavescens flavescens* (Merriam). Pale yellowish-brown lined with blackish above. Plains of South Dakota, Nebraska and Kansas, west to base of Rocky Mountains, and south to Texas.

Panamint Pocket Mouse.— *Perognathus panamintinus panamintinus* (Merriam). Total length, 6 inches; tail longer than head and body; ochraceous to grayish-buff above. Panamint Mountains, California, eastward through southern Nevada to St. George, Utah.

Pacific, or Least Pocket Mouse.— *Perognathus pacificus* Mearns. Smallest of Pocket Mice and one of the smallest mammals known; total length, 4.3 inches; above ochraceous buff thickly mixed with black. San Diego County, California.

Northwest Pocket Mouse.— *Perognathus lordi lordi* (Gray). Large; tail longer than head and body; slaty-buff strongly mixed with black. Plains of Columbia River, Washington, and southern British Columbia.

Hispid Pocket Mouse.— *Perognathus hispidus hispidus* Baird. Size large; brownish-black and cinnamon; pelage harsh. Texas north to Oklahoma.

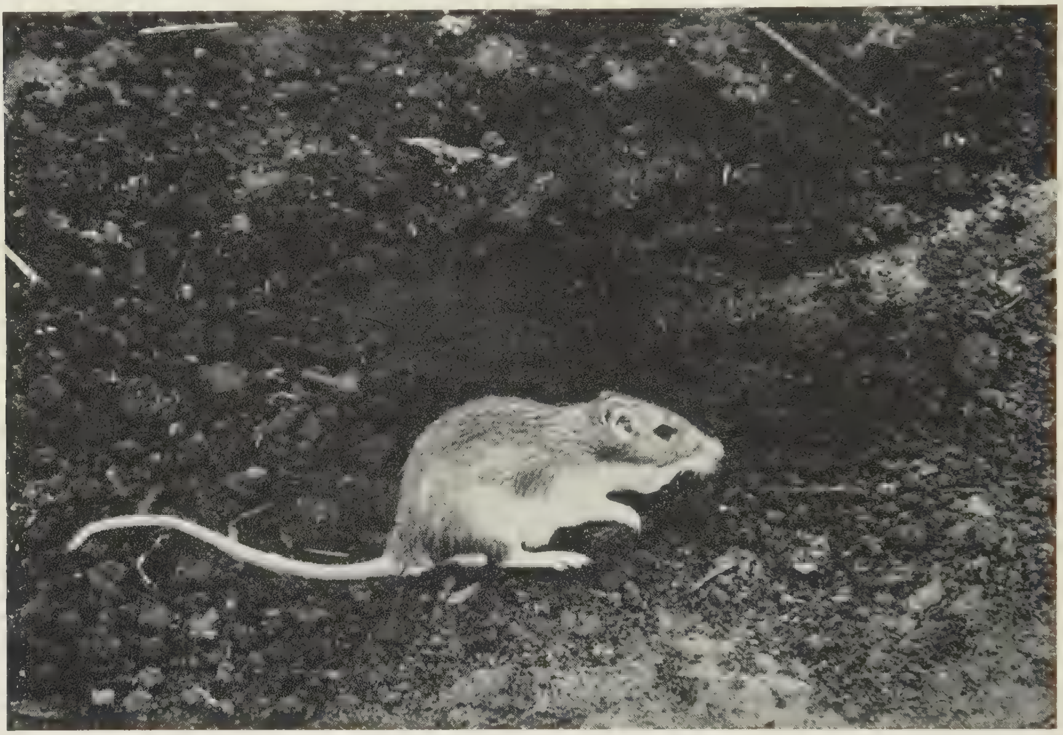
Spiny Pocket Mouse.— *Perognathus spinatus spinatus* Merriam. Size medium; drab-gray lined with black; spines on rump. Desert region of southern California.

The Pocket Mouse is a peculiar and interesting little fellow, whose nearest relative is the Pocket Rat, or Kangaroo Rat. The latter, in fact, may be called his big brother, so closely do they resemble each other. The Pocket Mouse belongs to a different family from the Meadow Mice and White-footed Mice, and may be easily distinguished from others by the external cheek pockets. Nearly all members of this group live in the desert or arid plains, and they are most numerous in the Southwest.

Few persons are at all familiar with this little rodent, and when one mentions the fact that there are a half hundred species of these odd-looking little creatures, the surprise of the listener grows apace. With the exception of the Pocket Gophers and the Jumping Mice, the Pocket Mice and Rats are the only North American mammals that have the pouches which give them their name. These serviceable receptacles, which are placed in the skin of each cheek, are hair-lined, have somewhat narrow openings, and extend back almost to the ears. In them their possessors carry seeds and berries of various kinds, often stuffing the pockets quite full.

Most of the species are inhabitants of the plains and the prairies, but a few make their homes in the interstices of rocks. In Texas, Merritt Cary caught one under a pile of rocks at the east base of the Davis Mountains at an altitude of about 5000 feet. Speaking of the *Yellow Pocket Mouse,* Vernon Bailey says: "At El Paso these little Yellow Pocket Mice were common in December, along the edges of the sandy valley bottom two miles below town, where little sand drifts were heaped up around the base of *Atriplex* and *Suaeda* bushes. Their burrows were usually in groups of three or four, under the edges of the bushes. The occupied ones were closed, and were discovered only by following the lines of tiny footprints across the bare patches of sand from bush to bush, till they disappeared at little mounds of fresh earth that served as doors and blinds to the underground houses. By scraping away the earth, a burrow big enough to admit a little finger was disclosed under each tiny mound. On chilly nights they did not move about much, but on mornings following a warm night their lines of tracks were abundant. One specimen caught December 15, was apparently nursing young."

All of the species are nocturnal, and, as far as known, none of them hibernate. When caught, " they do not offer to bite, but sometimes



Photograph by U. S. Biological Survey

POCKET MOUSE

Although very numerous in some localities, it is surprising how few people know about the remarkable features which differentiate these from ordinary mice

utter a fine squeak, and if held gently for a while soon cease struggling and seem to lose all fear. The light evidently hurts their eyes, and after blinking for a while they soon close them, if held quietly in the hands or placed in an undisturbed position on the ground."

The typical *Great Plains Pocket Mouse* is sometimes called Maximilian's Pocket Mouse, from the fact that it was first discovered by Maximilian, Prince of Wied, on a journey up the Missouri river, and described by him in 1839. One of the smaller members of the genus, it is easily distinguished by the olive-gray color of its upper parts.

The smallest of the group is the *Pacific* or *Least Pocket Mouse,* found on the shore of the Pacific Ocean, San Diego county, California. It is but little over four inches long.

A very curious species is the *Spiny Pocket Mouse,* a desert Mouse of southern California and northern Lower California. It has spines bristling on the rump, scattered on the flanks and sides, and often extending to the shoulders.

From the contents of the pouches in animals that have been trapped it is found that these Mice feed on seeds of all kinds. Juniper berries, corn, millet, planted peas, and cantaloupe seeds seem to be favorite items in the dietary of several species. Bailey says: "In a number of burrows I found juniper seeds, or the empty shells from which the kernel had been eaten out through a little hole in one end. In some cases these berries must have been brought from a distance of ten or twenty rods. In one den under a flat rock, where three tunnels, a foot to a foot and a half long, met in a nest chamber the size of my fist, there was a handful of fresh juniper seeds carefully cleaned of the outer pulp."

The enemies of these Mice are the usual enemies of the Mouse kind. The skin of a Pocket Mouse has been found in a burrowing owl's nest; and several rattlesnakes, on dissection, were found to have preyed upon other members. Domestic cats often bring them in, and they are often turned up by the plough.

POCKET RAT

Perodipus agilis *Gambel*

Other Name.— Kangaroo Rat.

General Description.— A thick-set rodent with very long tail and hind legs, having external cheek pockets. Head large and broad; whiskers long; eyes large; ears broad and rounded; tail thickly clothed with short hairs and terminating in a tuft; fore legs short; hind legs enormous, kangaroo-like; pelage exceedingly soft and silky. A nocturnal rodent living in burrows in the plains or desert areas.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{0-0}{0-0}$; Molars, $\frac{3-3}{3-3}=16$.

Pelage.— ADULTS: Sexes identical. Seasonal variation inconspicuous. Above, yellowish-brown mixed with black, the hairs slate-gray for the basal half or three-quarters; sides ochraceous-buff; below, clear white; spot over eye and behind ear, side of nose, and stripe running across hips and along each side of the tail to the end, white; a black crescent across sides of nose just before eye; tail above, blackish with blackish tip, paler below. YOUNG: Quite similar to adults, but colors not so contrasting.

Measurements.— Total length, 11.3 inches; tail vertebrae, 7.1 inch; hind foot, 1.6 inches; ear .5 inch.

Range.— Middle and southern California.

Food.— Strictly vegetarian; seeds, grain and miscellaneous vegetation.

Remarks.— There are three genera, further described below, containing 45 species and subspecies. The more important species of each genus follow.

RELATED SPECIES

Gambel's Pocket Rat.— *Perodipus agilis agilis* Gambel. Typical animal as described above. Middle and southern California.

Ord's Pocket Rat.— *Perodipus ordii ordii* (Woodhouse). Size medium; tail shorter than Gambel's Pocket Rat. From Snake Plains south to New Mexico and Arizona.

Richardson Pocket Rat.— *Perodipus richardsoni* (Allen). Larger than Ord's Pocket Rat. Ochraceous-buff lined with black. Oklahoma.

California Four-toed Pocket Rat.— *Dipodomys californicus californicus* Merriam. Size large, color dark. Northwestern California.

Desert Pocket Rat.— *Dipodomys deserti deserti* Stephens. Very large and pale; total length, 13.5 inches. Mojave and Colorado Deserts, California.

Spectacled Pocket Rat.— *Dipodomys spectabilis spectabilis* Merriam. Size very large; ochraceous-buff lined with black above, a black crescent on sides and top of nose just before eyes. Texas and Arizona eastward to Sierra Blanca, Texas.

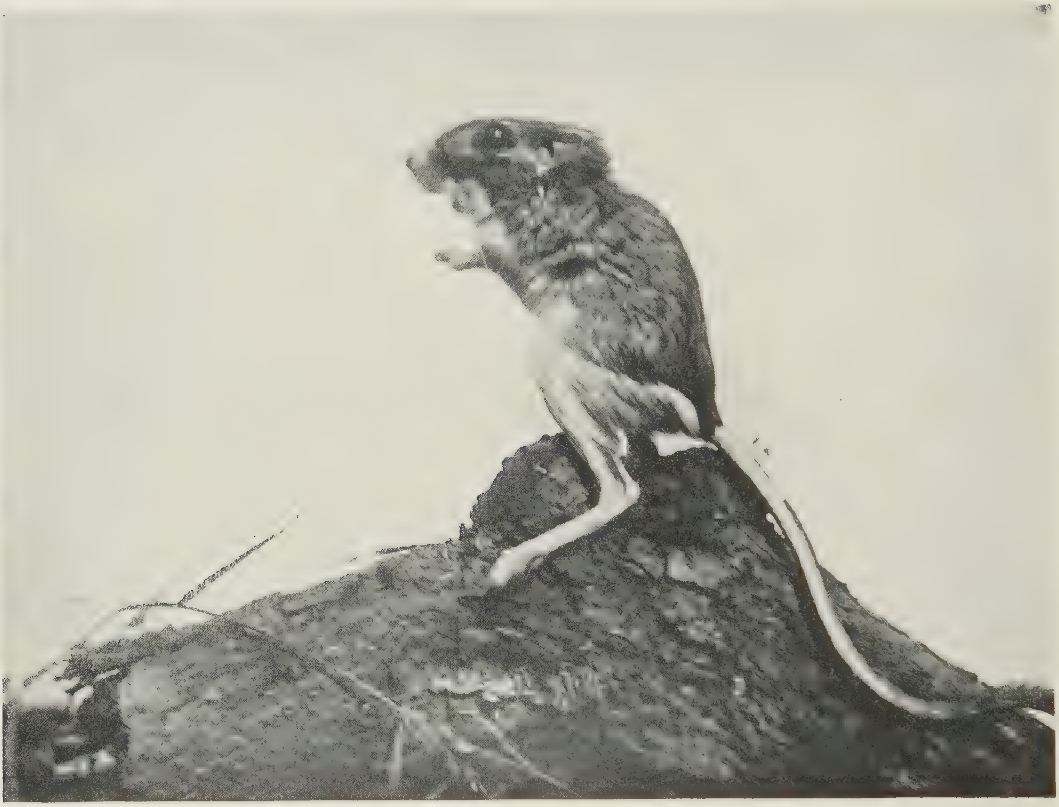
Merriam's Four-toed Pocket Rat.— *Dipodomys merriami merriami* Mearns. Above gray tinged with pinkish buff; size rather large. Arizona.

Pygmy Pocket Rat.— *Microdipodops megacephalus megacephalus* Merriam. Size small; tail not tufted at tip; head large; above, yellowish-brown mixed with black and olive; total length, 6 inches; tail vertebrae, 3.2 inches; hind foot, 1 inch. Central Nevada.

It is unfortunate that the name "Kangaroo Rat" has become attached to this group of beautiful rodents; for, as Bailey says: "they are as unratlike as they are widely removed from the Marsupials." The Kangaroo Rats have been termed the "handsomest Rats or Mice in the new world"; and few persons who have seen them will be inclined to dispute the correctness of this characterization. They are really very pretty creatures, with large, expressive eyes, and their fur is as soft as silk and of pleasing coloration. Like the Pocket Mice, they possess external hair-lined cheek pouches, and their skull is no thicker than a sheet of paper. As their name implies, they have the appearance of tiny Kangaroos, and their mode of progression resembles that of their namesake. The tiny "hands" and the tail are not apparently used in locomotion. Loring, who turned loose one that he had caught, noticed that "while jumping, its tail was slightly curved up and was not used in any way to aid in its progress."

Kangaroo Rats live in colonies, and excavate burrows. They do not hibernate, but they carry considerable food into their chambers, to be consumed during the day or, possibly, in bad weather. They seem indifferent to extremes of temperature, and flourish equally in hot and arid valleys and when running about on the snow. The absence of water seems to cause them no inconvenience, and they find subsistence where vegetation is most scanty.

These beautiful little rodents are closely related to the Pocket Mice which they resemble in the possession of cheek pouches, but they are a great deal more highly specialized. The very long hind legs and tail, in combination with the thick-set body and soft fur characterize this animal so well that it can be confused with no other group of rodents. There are three genera of Pocket Rats known. The genus *Perodipus,* having five toes on the hind feet and including some twenty-three species and subspecies; the genus *Dipodomys,* with hind feet having four toes only but otherwise almost identical with the first genus and containing some eighteen



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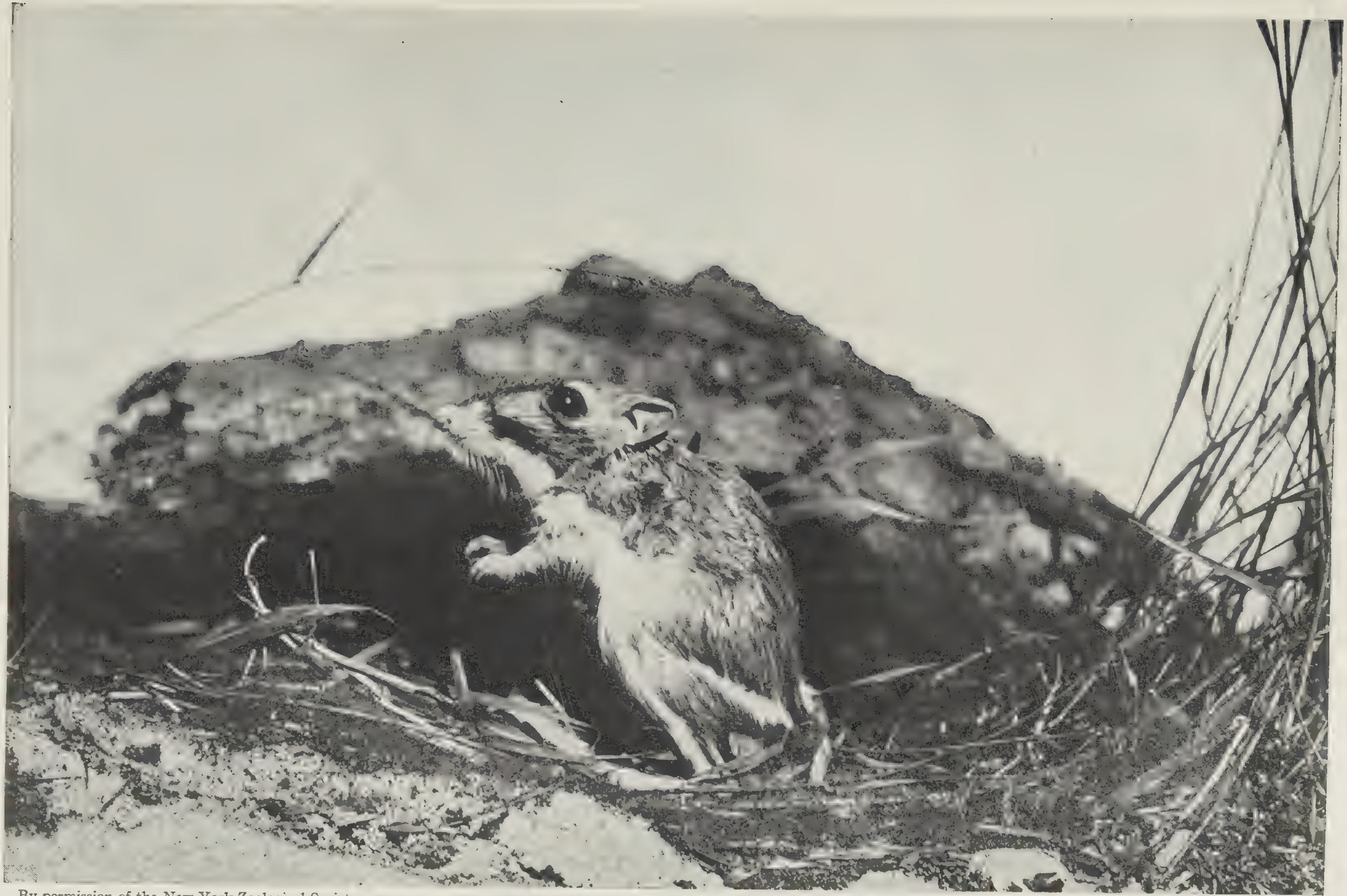
KANGAROO RAT

The reason for the name given to this little rodent is shown in the above statuesque photograph from life



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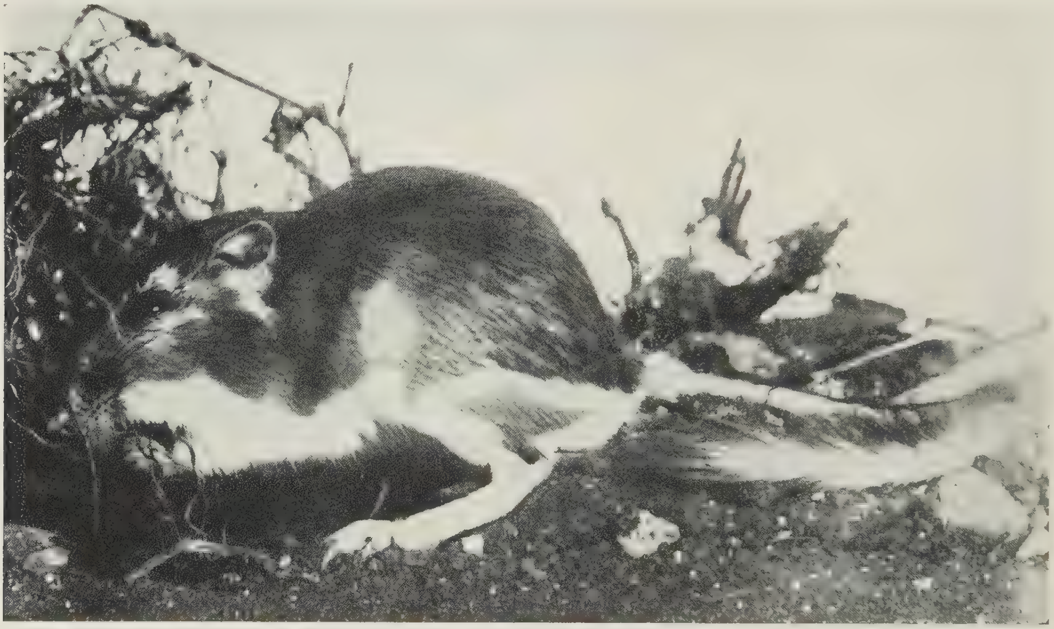
GAMBEL'S POCKET RAT

A native of middle and southern California, a typical member of a group noted for its cheek pouches and Kangaroo-like legs. Photograph nearly life size species and subspecies; and the genus *Microdipodops,* much smaller than either of the other two genera and containing four species.

The fifth toe of the genus *Perodipus* is so small that for a long time it was not discovered by the naturalists. Of the five-toed group, one of the best known is *Gambel's Pocket Rat* described above. One of the largest and handsomest is *Richardson's.* According to Bailey, it " fairly revels in the mellow soil of the yellow, shifting, naked drifts and dunes that the wind piles up along the edges of the river valleys." It scampers over the smooth surface with the apparent enjoyment of boys on a skating pond; sometimes it hops but a few inches, but often takes leaps of four to six feet. It makes large burrows, and " they go back horizontally, so that in case of a hard rain the water runs out of instead of into them." Its food is almost entirely seeds, which are always " neatly shelled out and eaten on the spot, or carried in the ample cheek pouches to the dens to be eaten at leisure." Unless the animals become more than usually numerous, Bailey considers " their depredations too insignificant for consideration."

The largest of the four-toed species is the *Spectacled Pocket Rat,* so called because of the peculiar marking around the eyes. Bailey thus describes their habits: " Although strictly nocturnal animals and rarely seen alive, these Kangaroo Rats usually make their presence evident by conspicuous mounds scattered here and there over the barest and hardest of gravelly mesas, mounds as characteristic and unmistakable as Musk-rat houses or Beaver dams, and as carefully planned and built for as definite a purpose — home and shelter. An old mound that has been inhabited for years is often three or four feet high and ten or twelve feet wide. Usually one or more of these doorways are closed each morning with earth behind the retiring inmates, probably to keep out rattlesnakes and other unwelcome guests. The animals are social. Often three or four are caught in a mound. When caught in traps or in the hands, the animals struggle violently, but never make a sound or offer to bite."



Photograph by Dr. R. W. Shufeldt

RICHARDSON'S KANGAROO RAT

A specimen photographed from life, in a Kansas wheat field

Merritt Cary in " A Biological Survey of Colorado " says, " Kangaroo Rats are stated to have been numerous in Colorado some years ago when only small areas were under cultivation. At that time they were very injurious to crops, digging up large quantities of newly planted grain and caching it in their burrows along the sandy margins of the fields, and also feeding extensively on tender green stems of wheat. The burrows are usually beneath bushes, or in beds of prickly pear, and more rarely under the large

Rabbit brush. There are usually from three to six entrances to a nest, each entering the ground at an angle of less than 45 degrees, sometimes nearly horizontal, and usually from different directions."

The typical home of the Kangaroo Rat is sandy river bottoms or on the numerous sand ridges scattered here and there over the plains. It is seldom found living in hard soils, but often takes up its abode in cultivated fields. The more or less horizontal burrows are excavated beneath bunches of prickly pear, yucca, and sage-brush, or in the banks of blow-outs and railroad embankments. The animals are nocturnal and most active during the latter part of the night. During the day the burrows are often closed from within, but early in the morning they are usually found open, with a quantity of freshly ejected sand at the entrances.

Little is known of the breeding habits of these animals; but of ten females of the *Ord Kangaroo Rat,* caught in New Mexico between November 29 and December 6, four were nursing young. At the same time numbers of nearly full-grown young were caught, "which would indicate either that two litters are raised in a season or that the breeding season is very irregular."

The *Pygmy Kangaroo Rat* is, as its name indicates, a very much smaller animal than either of the two other genera mentioned above. The hind feet are densely coverd with fur to the tips of the toes, and the ears are completely covered with soft fur. It is a habitant of Central Nevada.

All of the Kangaroo Rats are the prey of owls and snakes, especially rattlesnakes. One specimen was found "in the throat of a large rattlesnake that had swallowed it as far as the trap would permit." According to William Lloyd, who camped near Brownsville, Texas, they enjoy moonlight nights. On several occasions he saw them skipping about and they came close up to his bed. A lighted lantern seems to bother them greatly.

Photograph by S. A. Lottridge

JUMPING MOUSE

Jumping mice prefer the open grassy country, although species are found in widely varying localities

THE FAMILY OF JUMPING MICE

(Zapodidæ)

JUMPING Mice have several strong marks of distinction which enable even the ordinary observer to separate them from all other rodents. They are slender and graceful Mice with exceptionally long tails, short fore legs, extremely long hind legs which have given them their other name of Kangaroo Mice, and cheek pouches. Probably no other family of animals has more evident peculiarities. Like the Kangaroo, their muscular hind legs give them remarkable jumping powers, while their tails aid to balance them and give them direction. This family of rodents have the upper incisors compressed. The premolars are small, and the molars rooted. The hind foot has five separate toes. The tail, which is longer than the body, is slender and scantily haired. The family is widely distributed over North America, there being twenty-one species and subspecies, found from Canada to North Carolina, and westward to the Pacific Coast.

JUMPING MOUSE

Zapus hudsonius *(Zimmermann)*

Other Name.— Kangaroo Mouse.

General Description.— A medium-sized Mouse with rather harsh pelage and extremely long hind legs and tail. Head of normal proportions; nose pointed; ears small; body inclined to be thick-set; tail slender, tapering and sparsely covered with hair; hind feet enormously elongated; toes five in number on both fore and hind feet; pelage rather harsh because of the long, somewhat coarse, outer hairs. Hibernates in winter.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{1-1}{0-0}$; Molars, $\frac{3-3}{3-3}=18$.

Pelage.— ADULTS: Sexes identical. Seasonal variation occurring but not especially conspicuous. Above, strong ochraceous yellow mixed with blackish along the dorsal line; sides a brighter yellow; underparts and feet white, meeting the color of sides in a sharp line; tail above, dark, beneath, whitish; pelage composed mainly of a shorter coat with many long, coarser hairs. YOUNG: Like adults but lacking the well-defined dorsal band of blackish mixed with ochraceous.

Measurements.— Total length about 8 inches; tail vertebrae, about 5 inches; hind foot, 1.2 inches.

Range.— From southern Hudson Bay region south to New Jersey and North Carolina, west to Iowa and Missouri, and northwest to Alaska.

Food.— Green vegetation.

Remarks.— The only members of their family found in North America, the Jumping Mice are so well characterized as to need a critical comparison with no other Mice. Twenty-one species and subspecies are found in North America. Differentiation has taken place along the lines of color variation and size differences as well as in cranial structure. The group is a semi-boreal one, that is to say, it is found only in the mountains, in the higher latitudes, or in regions with climate temperate or colder. It is not known south of the United States.

RELATED SPECIES

Jumping Mouse.— *Zapus hudsonius hudsonius* (Zimmermann). Typical animal of the above description. From southern shores of Hudson Bay south to New Jersey, and in the mountains to North Carolina, west to Iowa and Missouri, and northwest to Alaska.

American Jumping Mouse.— *Zapus hudsonius americanus* (Barton). Smaller. From Raleigh, North Carolina, to southern Connecticut and lower Hudson Valley along the coastal plain.

Great Plains Jumping Mouse.— *Zapus hudsonius campestris* Preble. Size large. Great Plains from Manitoba to Nebraska, and westward to Colorado and Wyoming.

Rocky Mountain Jumping Mouse.— *Zapus princeps princeps* Allen. Size large, color yellowish-brown instead of ochraceous-brown. Rocky Mountain region from Northern New Mexico to Alberta.

Pacific Jumping Mouse.— *Zapus pacificus* Merriam. Size large, coloration very bright. Interior valleys of southwestern Oregon and northwestern California.

Woodland, or Canada Jumping Mouse.— *Napaeozapus insignis insignis* (Miller). Lacks the premolars found in true *Zapus;* size large; coloration pale; tail white tipped. Eastern Canada south to western Maryland.

The Jumping Mice are among the most interesting and remarkable of our small mammals. From their long and strong hind legs and long tails they have been called Kangaroo Mice, a name for which their extraordinary leaping powers give some justification; but the popular idea that, like the Kangaroo, they have a pouch in which they carry their young, is erroneous. More than a score of species and subspecies of these little animals are recognized, and, with one exception, a Chinese cousin, they all belong to North America, being distributed over the continent and found at such widely distant points as Labrador, Alaska, California, and North Carolina. The members of the Canadian group are generally to be found in dense woods not far from streams, but all of the other species delight in meadows, shrubby fields, and thickets along the edges of woods, and show a marked preference for moist locations.

All of these Mice hibernate; but some of them, emulating the Skunk and some Bears, will awake and come out in unusually mild winter weather. Usually they pass six months or more in a dormant state. They will sometimes store food in their nests in the summer months, but it has not been satisfactorily determined when this food is used.

The nests are usually holes in the ground, sometimes only a few inches, and sometimes two or three feet, below the surface, and occasionally they are found in hollow trees. Here the young (generally five or six) are born, in May or June, and sometimes as late as September.

It would be difficult to decide just how far one of these animals could jump. They have been known to cover as much as six or eight feet, but statements crediting them with the ability to leap four or five yards must be received with suspicion. When even six feet is considered in relation to the little acrobat's own length, little more than half a foot, it will be seen that it can cover a distance at least twelve times its size.

Mr. Edward A. Preble, writing of the habits of the common Jumping Mouse, says: " During the summer, they are often seen in meadows and fields, and are more readily detected during the haying season than at other times, when they are driven from their hiding places while the grass is being cut. When disturbed, they move off by a series of frog-like leaps, and often remain motionless after a jump or two, especially when frightened from a nest. In leaping they are greatly assisted by their long tails, which aid in preserving their balance, as in the case of other animals similarly endowed. If, by any accident, a portion of the tail is lost, the power of balancing is greatly impaired, and the animal, if startled, seems unable to pursue a direct course because of failure to land properly on its feet. In their chosen haunts these Mice do not follow beaten paths or runways, like many small mammals, notably Meadow Mice, but seem to wander rather indiscriminately, availing themselves to some extent of natural pathways or open places."

The nest of this species is globular and about four inches in diameter, and has a small entrance at the side. It is often made of straight narrow leaves or grass and is a beautiful little home.

The Jumping Mice are harmless, inoffensive little things, and will often allow themselves to be taken in the hand and stroked without making any attempt to escape. Witmer Stone thinks they are " decidedly less intelligent than other Mice, trusting mainly to good luck and their gift at jumping to carry them through whatever dangers threaten. Apparently they never look before they leap, so that that which should be their safety often proves their ruin, as they are about as likely to spring directly into the clutches of a cat or other enemy as in an opposite direction; in this manner they are frequently drowned in milk-pans and tubs of water which a little ordinary caution would have avoided."

In the deep woods and near some stream is the locality in which to seek the *Woodland* or *Canadian Jumping Mouse*. It is more timorous than others and scuttles away from man with hops and bounds as fast as its legs will carry it. It is a large Mouse, having a total length of nine inches, its tail measuring nearly six inches. A noteworthy peculiarity of this species is the absence of premolar teeth. It is found through eastern Canada south to western Maryland. In habits it is similar to the Hudson Bay species.

THE FAMILY OF POCKET GOPHERS

(*Geomyidæ*)

THE Pocket Gophers are the only rodents to which the term "gopher" can be accurately applied; although it has been used erroneously for other burrowing animals of the Ground Squirrel tribe. The family *Geomyidae*, however, are our only true American Gophers, and are numerous enough and pestiferous enough to warrant all the profanity which has been levelled at "Gophers" indiscriminately.

This family includes a group of thick-set rodents which receive their distinctive name, "pocket," from the presence of large, fur-lined cheek pouches opening outside the mouth. These are used as genuine pockets for carrying things of quite as much value to the Gopher as the contents of their pockets are to small boys. The eyes and ears of these rodents are very small; the skull is broader than it is deep; the molar teeth have no roots; the fore feet are armed with long claws especially adapted for digging.

POCKET GOPHER

Geomys bursarius (*Shaw*)

Other Names.— Prairie Pocket Gopher, Red Pocket Gopher.

General Description.— A medium-sized burrowing rodent with small eyes and ears. Head broad and blunt; eyes very small; ears small; external cheek pouches fur-lined and opening on sides of face; incisor teeth large and prominent; body rather thick-set; tail short, thick and very scantily haired; legs short; claws long, especially so on the fore feet; pelage rather short but very soft; general color dull chestnut-brown, underparts paler. A burrowing animal little seen, but throwing out conspicuous mounds of earth.

Dental Formula.— Incisors, $\frac{1-1}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{1-1}{1-1}$; Molars, $\frac{3-3}{3-3}=20$.

Pelage.— Adults: Sexes identical. Seasonal variation occurring but not conspicuously noticeable. Upper parts dull chestnut-brown; underparts paler; bases of the hairs dark plumbeous; feet white; hair on basal portion of tail like back, terminal portion white. Young: Similar to adults but colors weaker.

Measurements.— Total length, 11 inches; tail vertebrae, 3.2 inches; hind foot, 1.4 inches.

Range.— Upper Mississippi Valley, south of the Canadian boundary, from southeastern Missouri and southern Illinois eastward to Lake Michigan, westward to the Dakotas and Nebraska, southward to eastern Kansas.

Food.— Strictly vegetarian; roots and green vegetation.

Remarks.— The Pocket Gophers are a very large group, there being three genera in the United States with some 78 species and subspecies. All but one of these belong to two groups which might be called respectively the Eastern and the Western Pocket Gopher groups. The best distinguishing character is the possession of grooved incisors by the members of the Eastern Pocket Gopher group, and ungrooved by the Western. A wide range of variation is shown in size and color, as these animals reflect quite closely the effects of their habitat and environment.

Related Species

Pocket Gopher.— *Geomys bursarius* (Shaw). Typical animal of the above description. Upper Mississippi Valley from Kansas, Missouri, Illinois, the Dakotas and Nebraska east to Lake Michigan.

Short-headed Pocket Gopher.— *Geomys breviceps breviceps* Baird. Smaller and darker. Lowlands of Mississippi Valley and Gulf Coast of southern Arkansas, Louisiana and Texas, northward nearly to Kansas, and west to 98th meridan.

Texas Pocket Gopher.— *Geomys texensis* Merriam. Small and white-bellied. Texas, central and southern parts.

Georgia Pocket Gopher.— *Geomys tuza tuza* (Ord). Tail longer and more naked; color above cinnamon brown. Pine barrens of Georgia.

Chestnut-faced Pocket Gopher.— *Cratogeomys castanops castanops* (Baird). Size medium; upper incisor with a single groove; yellowish-brown mixed with black above, beneath buffy. Great Plains from Colorado southward through eastern New Mexico and western Texas.

Columbia Pocket Gopher.— *Thomomys bulbivorus* (Richardson). Largest of the Pocket Gophers in the United States; total length, 14 inches; color dark; slaty-black. Lower Columbia River to coast of California.

California Pocket Gopher.—*Thomomys bottae bottae* (Eydoux and Gervais). Size medium; chestnut-brown above. Coast of California.

Golden Pocket Gopher.—*Thomomys aureus aureus* Allen. Size large; golden-yellow above. Utah.

Pallid Pocket Gopher.—*Thomomys perpallidus* (Merriam). Size medium; color very pale. Desert regions of southern California and Arizona.

Pygmy Pocket Gopher.—*Thomomys clusius clusius* Coues. Smallest species known; colors pale. Wyoming, Utah and Idaho.

Brown Pocket Gopher.—*Thomomys fuscus fuscus* (Merriam). Size small; chestnut-brown above. Found in Idaho.

Nevada Pocket Gopher.—*Thomomys nevadensis* Merriam. Large; two color phases, pale buff and plumbeous slate. Nevada.

Black Pocket Gopher.—*Thomomys niger* Merriam. Size medium; black. Western Oregon.

Canada Pocket Gopher.—*Thomomys talpoides talpoides* (Richardson). Size large; grayish black. Saskatchewan region south to upper Missouri.

If the farmers and fruit growers of the United States were polled on the question, "Which of the rodents, Field Mice, Rabbits, or Pocket Gophers, do you consider your worst pest?" the probability is that the unenviable distinction would be conferred on the Pocket Gopher. Rabbits work above-ground and protective measures can be taken against their depredations; Pocket Gophers operate under-ground, and, consequently, their ravages can seldom be forestalled.

The three genera of this family that occur in the United States are differentiated from one another by the kind of grooves which they have on their upper front teeth. In the largest genus, *Thomomys,* the upper incisors have each a very fine groove on the margin or none at all; in the genus *Geomys* the species have two distinct grooves; and in *Cratogeomys* there is one median furrow only. It is these sharp, powerful incisors which cause all the trouble for the farmer. Not only are they used in digging burrows or tunnels, which often admit surface water, leading to the washing of deep gullies, and sometimes cause breaks in canal banks and levees, but with them these "pesky little varmints" gnaw the roots of fruit and other trees, causing serious damage. Mr. David E. Lantz (Yearbook of U. S. Dept. of Agriculture, 1909), relates that in Heppner, Oregon, the owner of an orchard was absent from home but a week, and found on his return that Gophers had destroyed forty of his choice fruit trees. Originally these animals fed on the stems and roots of native plants; but no sooner had the settler introduced cultivated grasses and vegetables than the Gophers turned their attention to clover, alfalfa, and the succulent products of the gardens.

How swiftly the Gopher works when gnawing roots may be realized from observations of a tame animal made by Vernon Bailey. He says ("Pocket Gophers of the United States"): "The upper front tooth, or incisor, is used chiefly to anchor the animal to the root to be operated on, while the lower incisor does most of the work, playing rapidly back and forth like a steam drill until a piece is cut off and passed into the mouth. The cutting edges of the enamel plates of the molar teeth are the tools that reduce the food. The plates are arranged in such a way that thirty-eight distinct single cuts are made by the forward stroke of the jaw and twenty-eight by the backward stroke. In a tame Gopher it was ascertained by actual count that 200 complete strokes are made each minute. On this basis the number of cuts made each minute of the forward stroke would be 7600, and on the backward stroke 5600, making a grand total of 13,200 cuts a minute while the jaws are in active operation."

Pocket Gophers are strict vegetarians, subsisting mainly on roots, tubers, grass and the succulent parts of plants. They are not known to drink, and persons who have kept them in confinement have never succeeded in inducing them to do so. They derive the necessary water from the plants on which they feed. As their eyes are small and their vision limited, they must depend on touch, taste, and smell in selecting their food. In each cheek is an external hair-lined pouch in which the animals carry food to their storehouses. These pouches are never used for conveying dirt in burrowing, as has often been inaccurately stated. Enough food for a good meal can be collected and stowed away in these pouches in half a minute.

Bailey says the flesh of the Gopher is "tender and well flavored, and, were the animals large enough, they might be made a valuable adjunct to our meat supply." That many birds and beasts consider them dainty morsels is evidenced by the long list of their natural enemies, including hawks, owls, foxes, wild cats, and above all the weasel and the bull, or gopher, snake.

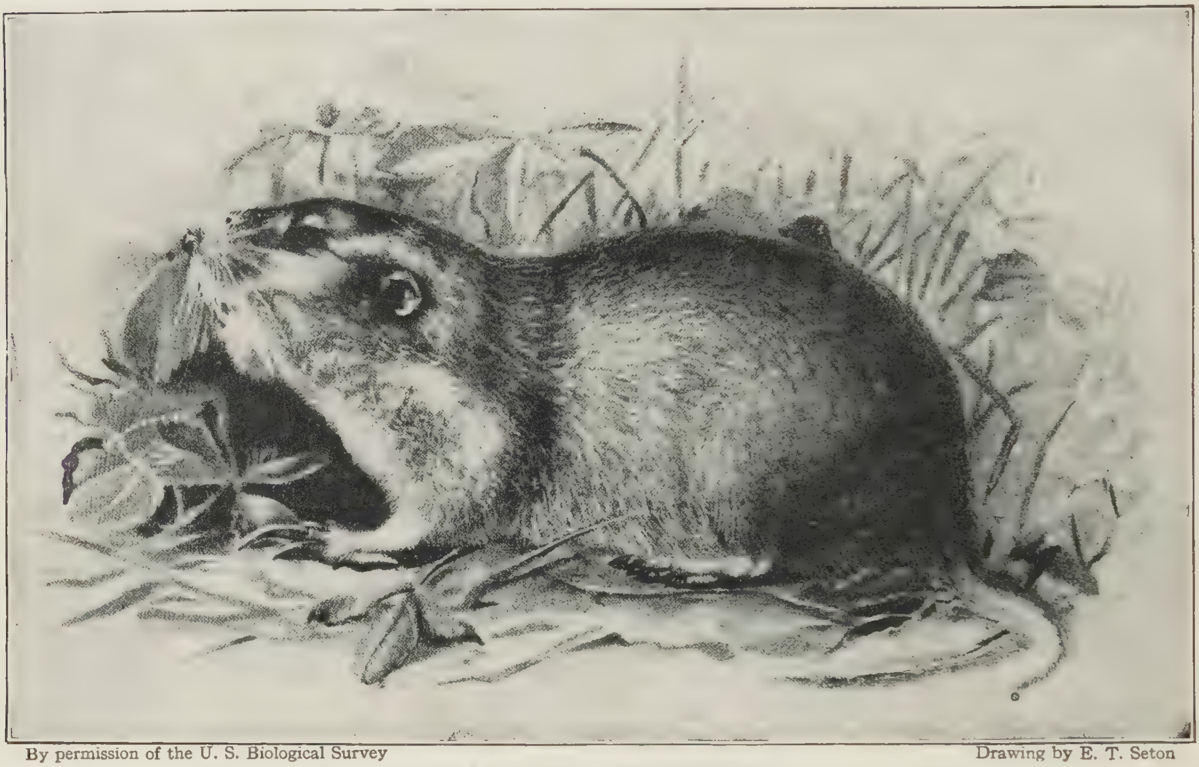
Pocket Gophers are not wholly nocturnal animals; they do not hibernate; only one litter a year is raised; and the number of young is from two to six. All Gophers are exceedingly pugnacious, and will fight even man or dog.

"Gopher burrows seem to have neither beginning nor end," writes Vernon Bailey. "They are extended and added to year after year, and in many cases those dug by a single animal would measure a mile or more, if straightened out. At the end of a year a Gopher may often be found within twenty rods of the point from which he started, but in traveling this distance he has paid no attention to the points of the compass. He follows a tender root for a few feet, then moves to one side, encounters a stone and makes a second turn. A layer of mellow soil entices him off in another direction, and so on through a thousand devious crooks and turns. At intervals openings are made through which to discharge the earth that makes the little piles called Gopher-hills."

Gophers have regular storehouses where roots and other foods are stored away, being carried in the peculiar pockets on each side of the face.

Dr. Goode describes their digging habits as follows: "They dig by grubbing with the nose and a rapid shovelling with the long curved fore-paws assisted by the pushing of the hind feet, which removes the earth from beneath the body and propels it back with great power a distance of eight or ten inches. When a small quantity of earth has accumulated in the rear of the miner, around he whirls with a vigorous flirt of the tail and, joining his fore-paws before his nose, he transmutes himself into a sort of wheelbarrow pushing the dirt before him to a convenient distance."

Merritt Cary, in "A Biological Survey of Colorado," says, "Ranchmen in the foothill valleys and mountain parks suffer considerable loss through the depredations of these animals, and every year a large acreage of alfalfa is killed by Gophers cutting the roots just beneath the surface of the ground. We discovered, three inches below the surface, a cavity in which a Gopher had a store of nearly fifty tiger-lily bulbs, evidently gathered the previous fall. The cavity was nearly full, and the bulbs were scattered through loose earth, which had been thoroughly worked over. A tunnel led directly from the cache to the flower-bed a rod or so distant. Near Golden the Gopher is said to



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Drawing by E. T. Seton

PRAIRIE POCKET GOPHER

The specimen from which this drawing was made was secured in Manitoba. About two-thirds natural size make itself a nuisance by burrowing in the banks of irrigation ditches and reservoirs, and this is probably true in other sections along the lower edge of its range. The numerous hills of earth and stones thrown up in hay meadows and grain fields dull the sickles of mowing and harvesting machines."

As an offset to the injury inflicted upon agricultural interests along the lower edge of its range, this animal is an important agent in the conservation of the forests and moisture in the higher mountains, where it is most abundant. The thorough and continual working and enriching which the soil receives through the activities of Gophers is highly beneficial to forest growth, and at the same time a large amount of moisture which would otherwise run off the mountain slopes is retained in the numerous burrows and underground tunnels which might properly be termed natural water traps.

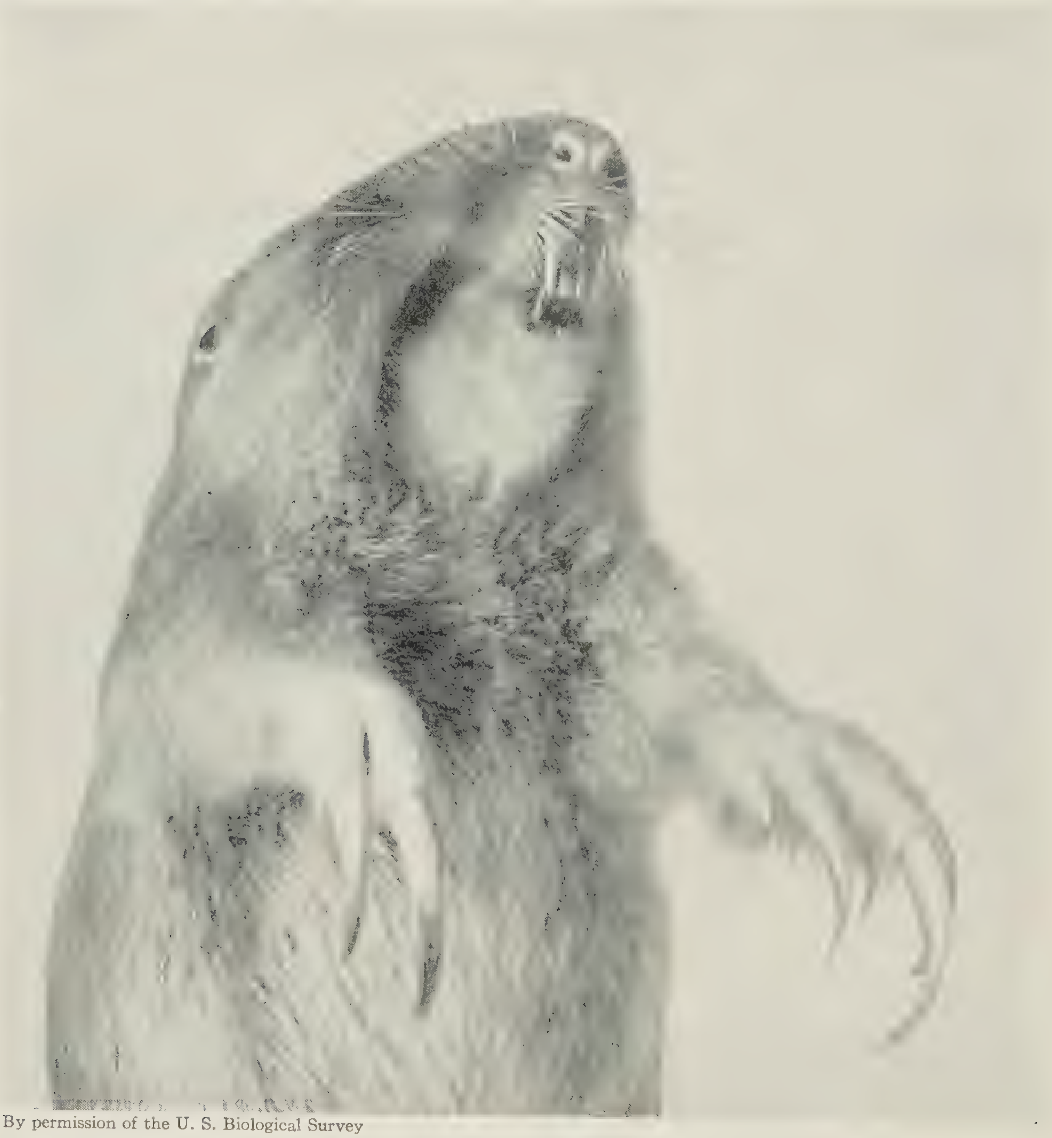
On the higher open mountain slopes, particularly above timber-line, one often sees peculiar long serpentine ridges of earth, sometimes dry and hard packed, but more often partially disintegrated through the action of moisture. These are formed by Gophers during the winter when snow covers the ground to a considerable depth. The loose earth thrown out is packed into the ramifying tunnels which the animal has made through the snow on the surface of the ground.

With reference to breaks in levees caused by Gophers, it should be stated that means have been discovered whereby these expensive and often disastrous operations of the little burrowers can be arrested. Mr. Robert E. Jones writes: "When a burrowing Gopher strikes sand he stops. Nature has failed to provide him with the means for penetrating that kind of bank." Taking advantage of this fact, Mr. Jones has constructed a levee the outside casings of which are river bottom soil and the center is sand. This kind of levee has been brought into use on the Sacramento river, and has proved in every way effective.

OUT FOR A RAID

The Pocket Gopher is the terror of every farmer. It has a greedy appetite, and capacious pockets in its cheeks

The Prairie Pocket Gopher, the typical form described above, ranges the Mississippi valley from the Canadian border, south to southern Illinois, and from Lake Michigan to Nebraska. By reason of the fertility of the territory which it inhabits, Bailey considers this species of greater economic importance than all the other species combined. It is not rare to find one of its holes extending along a potato row, and every hill entered and entirely cleaned out. The damage they do is indeed enormous. Hickory saplings two inches through with their roots all eaten off; two hundred apple trees destroyed in two years; thirty-five bushels of sweet potatoes taken from a cellar; two bushels of potatoes stored away in one burrow; fifty yards of hedge cut off — these are a few of the depredations cited by Bailey. His dog once dug out a nest containing two young Gophers. "They had no visible hair, their complexion was a beautifully translucent pinky white, their heads were round, and their little fat hands and fingers were touchingly babylike. Both eyes and ears were tightly sealed. They were helpless, and had the appearance of being born in a very rudimentary or undeveloped condition. The nest was a bed of soft grass and vegetable fibers on the bottom of an oval chamber in the burrow."



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GEORGIA POCKET GOPHER

Nearly life-size. The enormously developed claws on the fore feet, adapted for digging, and the external cheek pouches are here well shown

THE PIKA FAMILY

(*Ochotonidæ*)

PIKAS occupy a family to themselves. They are rodents with forms somewhat between the Guinea-pigs and Rabbits, and at first glance might be mistaken for small brownish Rabbits. Unlike them, however, they are sluggish and do not run fast. They have also been found to have such highly specialized traits as to make it easier to classify them by giving them a separate family. These rodents, like the Hares, occupy a sub-order known as *Duplicidentata*, so called because of the presence of two pairs of incisor teeth in the upper jaw; one pair being smaller and set immediately behind the other.

The Pikas are found only in the higher mountains of northwestern North America. Their only relatives are to be found in Asia. Their closest relations in North America are with the Hares, to which they bear a superficial resemblance. They frequent mountainous regions of the west and northwest, especially along the timber line.

PIKA

Ochotona princeps (*Richardson*)

Other Names.— Cony, Little Chief Hare, Rock Rabbit, Tailless Hare, Whistling Hare.

General Description.— A small rodent lacking a tail and having somewhat the appearance of a diminutive rabbit. Head rather large and broad with conspicuous whiskers and large broad ears; body thick-set; no visible external tail; legs short; soles hairy; pelage thick, long, lax, and soft to the touch; toes, five on fore feet, four on hind feet; general color, brownish-gray or yellow.

Dental Formula.— Incisors, $\frac{2-2}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{2-2}{2-2}$; Molars, $\frac{3-3}{3-3}=26$.

Pelage.— ADULTS: Sexes identical. Seasonal variation occurring but not especially conspicuous. Head and shoulders yellowish-brown, rest of upper parts grayish-black; sides yellowish-brown; underparts smoky-gray, tinged on chest and parts of belly with brown; ears bordered with white; feet white; soles dusky-brown. YOUNG: Grayer than adults.

Measurements.— Length, 7.5 inches; no external tail.

Range.— Rocky Mountains in British Columbia northward to south branch of Mackenzie River.

Food.— A variety of green plants, leaves of shrubs and grasses.

Remarks.— Twelve species of this peculiar rodent are recognized, the main distinctions being along the line of cranial and color variations.

RELATED SPECIES

Pika, or Cony.— *Ochotona princeps* (Richardson). Typical animal as described above. Rocky Mountains in British Columbia, northward to Mackenzie River.

Sierra Nevada Pika, or Slate-colored Pika.— *Ochotona schisticeps* (Merriam). Coloration from nose to nape slate-gray, rest of upper parts suffused with fulvous. Higher parts of the Sierra Nevada Mountains, California.

Collared Pika.— *Ochotona collaris* (Nelson). Ears thickly haired, iron-gray color on back and sides of neck; chin and throat white. Mountains from head of Tanana River to head of Bristol Bay, Alaska.

Colorado Pika.— *Ochotona saxatilis* Bangs. Pale yellowish-brown mixed with black on head and back. Colorado.

Little Pika.— *Ochotona minima* (Lord). Size small, color dark. Cascade Mountains, British Columbia.

Tawny Pika.— *Ochotona cuppes* Bangs. Colors dark, with much tawny on head, neck and underparts. Gold Range, British Columbia.

"The Conies are but a feeble folk, yet make they their houses in the rocks." If the writer of this passage in the Book of Proverbs had had in mind the Pikas, or Conies, of our western mountains, he could not have described them more accurately; for away up on the sides of high mountains, in the neighborhood of "slides," or masses of debris at the base of some cliff, these little animals have their homes The lowest altitude at which a colony of them was found by Dr. C. H. Merriam, in Idaho, was 8600 feet.

The Pikas, of which twelve distinct American species are now recognized, constitute the sole genus of this family. They are curious little creatures whose appearance is something between that of a Guinea-pig and a Rabbit. They are seven or eight inches long, with small eyes, large and rounded ears, no external tail, hind limbs relatively shorter than those of the Hares, and "a rudimentary thumb with claw." The soles of their feet are padded with fur, enabling them to leap from rock to rock without losing their footing.

They are noisy little things, and "betray their presence to the intruder on their domains by sharp, squeaking, querulous ventriloquial notes or cries, deceptive as to distance and locality." They feed exclusively on vegetable matter, and lay up stores of grass and other herbage for the winter. They do not hibernate. The young are produced in the spring, about May, and there are generally four at a birth.

For so small and rare an animal, it has been greatly blessed with names. It is also called Chief Hare, Tailless Hare, Calling, or Whistling Hare, Rock Rabbit, and (from the fact that it never gets fat), by the miners of certain districts, "starved rat."

The Pika is found in the Rocky Mountains in British Columbia to the south branch of the Mackenzie River. In Idaho, in the Salmon River, and Saw Tooth Mountains, Dr. Merriam found it ranging from the Canadian zone to within a short distance of the summits of the highest peaks. It was encountered most abundantly in the neighborhood of timber line, between the altitudes of 10,000 and 11,000 feet. Pikas are nimble, active little bodies, "springing lightly from rock to rock, and running swiftly to and from their feeding grounds, often several hundred feet away." As stated above, they are vegetarians, their chief food-plant being the arctic-alpine *Geum rossii.* "This," says Dr. Merriam, "is their 'hay,' and they lay up large quantities of it for winter use, depositing it in little heaps in the spaces between the rocks. These storehouses average about the size of a bushel measure."

The Pikas are as industrious as the proverbial busy bee. In the early fall they may be seen for hours at a stretch carrying hay to their garners, running swiftly to the side of the rock slide, gathering a mouthful of leaves, and returning as quickly to deposit it in the accustomed place.

It is not known whether the Pika is night-loving as well as day-loving. Dr. Merriam once heard it at night, under exceptional circumstances. "One afternoon, about the first of September, Mr. Vernon Bailey and I carried our blankets up above timber line on the Salmon River Mountains and spent the night there. As darkness fell upon the mountains a storm set in. The wind blew a furious gale and rain began falling. Soon the rain changed to hail and sleet, and finally to snow. Much to our surprise, we heard the unmistakable cry of the Pikas at frequent intervals throughout the night. Whether they are usually nocturnal as well as diurnal, or whether the storm set them at work to move their storehouses to safer places, we have no means of knowing."

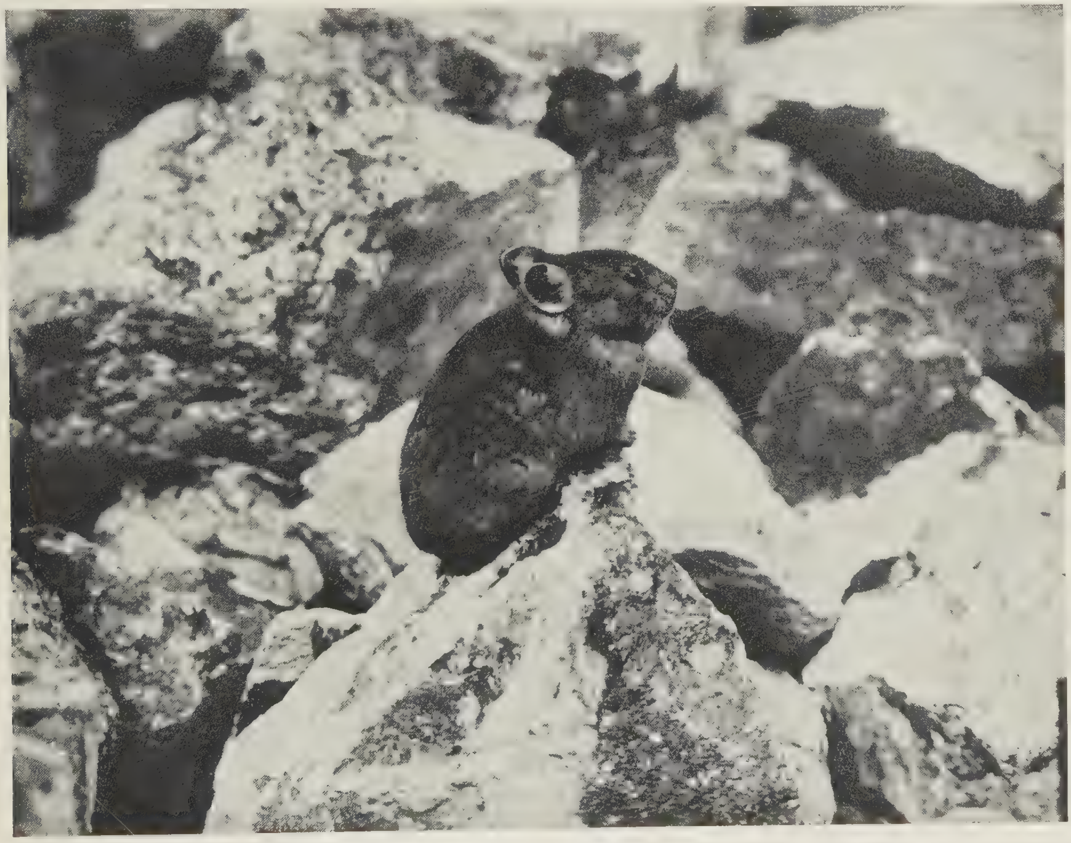
Photograph by J. M. Johnson

PIKA

A queer little animal living among the crevices of rocks; also called "Whistling Hare," or "Calling Hare," for its vocal attainments

The Pika's favorite retreats are crevices in the rocks, to which it swiftly runs when alarmed; but as it is fond of sunning itself, and its feeding grounds are frequently at some distance from home, eagles and hawks have many opportunities of making a feast from one of these careless little animals.

Merritt Cary, in "A Biological Survey of Colorado," says, "The habits of Conies are most interesting. As far as my observation goes, they live entirely in slide rock, usually on steep slopes, but near Silverton, Loring found their characteristic haystacks in the crevices of lumber and slab piles near an abandoned sawmill, while Mr. D. Costello, of Gardner, tells of one which took up its abode beneath the floor of a cabin in the mountains north of Crested Butte. The haystacks of these industrious little animals, comprising their winter food, are composed of many species of grasses and weeds, cut and gathered in summer, and allowed to dry among the rocks. Thistles are found in most of the stacks, and seem to be a favorite food. Well-worn runways lead from one stack to another and extend to neighboring rock slides. Conies are usually quite shy and would be seldom observed were it not for the odd, complaining notes which they utter continually when alarmed. The grayish color of the animal closely matches the dull-colored rocks in which it is found, and the notes often appear to come from a distant pile of rocks, when in reality the motionless animal is within a few feet; or again, the reverse may be true."



Photograph by Edward R. Warren

PIKA, OR CONY

A sure-footed little beast that is found in mountain regions, most abundantly about the timber line. It subsists on grass and other vegetation

THE FAMILY OF HARES AND RABBITS

(*Leporidæ*)

THERE is a great deal of popular confusion between the terms "hares" and "rabbits." To most people they mean the same thing; when as a matter of scientific fact they are two separate groups, each with its own well-defined species. This distinction is all the harder to make because the two animals have long been given interchangeable names. For example, our Jack Rabbits and Snowshoe Rabbits are not Rabbits, but Hares. On the other hand, the animals known as the Swamp Hare and the Pygmy Hare belong to the Rabbit group, as do the "Cottontails." In the case of the Jack Rabbits, the erroneous name has now been in use for more than half a century. As long ago as 1851, Audubon and Bachman, writing of a species found along the Mexican border, said: "This species is called the jackass rabbit in Texas, owing to the length of its ears." For the same reason, in certain parts of California they have been called "narrow-gauge mules" and "small mules." At this late day it is just as useless to attempt to change the name of the Jack Rabbit as it is to try to persuade the public to adopt the name Bison for the Buffalo; but it should be borne in mind that the Jack Rabbit is not a Rabbit, but a Hare.

There are certain well-defined characteristics by which Hares can be distinguished from Rabbits. The former never make burrows, but live in "forms" or nests of a kind (in which the young are brought forth), and are long-eared, long-legged, and swift-footed animals, the hind legs being considerably elongated. Rabbits proper have short ears, are short-legged, cannot maintain much speed for any great distance, and all of them make more or less use of burrows — frequently the abandoned homes of other animals — or of sheltering tree-roots, rocks, or similar places. Some of the species make their own burrows or tunnels. The young of Hares are born with a well-developed coat of hair and with their eyes open; baby Rabbits are born naked and with closed eyes.

Hares and Rabbits are among the best known of American animals. They range from northern Greenland to Patagonia and over the entire breadth of the two continents. Some of the species are to be found on the prairies, others make their homes in coverts and woods; some live in deserts where is little food and less water, others have their habitat in swamps and marshes; some roam the plains, others are to be found at altitudes of 14,000 feet or more above sea-level; and through all the gradations of temperature, from 50 degrees or more below zero to 140 degrees above, they seem to thrive and multiply. They reach their greatest abundance, however, in a stretch of country which Mr. E. W. Nelson, in his book "The Rabbits of North America," calls the "American Desert Plateau region." This region extends in a northerly and southerly direction from the northern United States to central Mexico, is about 2,000 miles in length, and has a maximum width of about 800 miles.

The coat of the Hare and the Rabbit corresponds, as to density and length, to the mildness or severity of the climate. In the Far North the Greenland Hare has a long, dense, woolly coat, while in southern Mexico the Tehuantepec Cottontail has a thin, short, and rather coarse pelage. The color of these animals also responds to climatic influences. Some of the species, which have two annual molts, are white in winter and dark in summer; but in Northern Greenland the Hare remains white throughout the year. The coat itself is made up of three sets of hairs: "(1) a fine, short, and dense underfur; (2) a longer, thinner, and coarser coat of hairs, the tips of which overlie and conceal the under-fur; and (3) a still longer, coarser, and more sparsely distributed set of hairs, the tips of which overlie the shorter middle coat."

The family *Leporidæ* is technically described as rodents of good size, robust body; hind limbs longer than the fore limbs; tail very short; wing-shaped postorbital processes; teeth more numerous than in any other family of rodents; incisors large, upper ones grooved; molars rootless; facial surface of maxilla perforated; clavicles imperfect. Specific differences between the Hares and the Rabbits have already been mentioned.

ARCTIC HARE

Lepus arcticus *Ross*

General Description.— A very large Hare turning white in winter, and living in Arctic America. Similar to the Varying Hare, but much larger and heavier. Head and ears large; body heavy; tail short; legs long; hind legs longer than fore legs; pelage long and thick, very soft to the touch; in summer white mixed with brown and gray; in winter pure white.

Dental Formula.— Incisors, $\frac{2-2}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{3-3}{2-2}$; Molars, $\frac{3-3}{3-3}=28$.

Pelage.— ADULTS: Sexes identical. *Summer.* Everywhere white, mixed sparingly with brown and gray, the long hairs black pointed; face and ears, tawny-gray with black hairs on tips of ears; the white hairs are white throughout their entire length or white to the base. *Winter.* Pure white.

Measurements.— Total length, 26.5 inches; tail vertebrae, 2.5 inches; hind foot, 6 inches; ear, 4.7 inches. Weight, 10 to 12 pounds.

Range.— Baffin Land, extreme north coast of Hudson Bay, south through Ungava to Great Whale River on east shore of Hudson Bay, and Labrador north of Hamilton Inlet.

Food.— Green vegetation and bark of willows.

Remarks.— The Hares of the Arctic group are the largest of the North American Hares. Some of the Jack Rabbits, or Prairie Hares, measure almost as much as the Arctic Hares, but the latter are much heavier. Six species and subspecies belong to this group, all quite similar in general appearance, but varying a little in color, size and cranial characters.

RELATED SPECIES

Arctic Hare.— *Lepus arcticus arcticus* Ross. Typical animal as described above. Baffin Land, northern and northeastern Hudson Bay region, Ungava and Labrador.

Newfoundland Hare.— *Lepus arcticus bangsii* Rhoads. Grizzled gray in summer. Newfoundland and adjacent parts of Labrador.

Greenland Hare.— *Lepus groenlandicus* Rhoads. White suffused with tawny in summer. Northern Greenland and Ellesmere Land.

Alaska Arctic Hare.— *Lepus othus* Merriam. Size largest of the Arctic Hares. In winter everywhere white except ears which are black tipped. Tundras of northern and northwestern Alaska.

The Arctic Hares live in the frozen wastes of the Far North. Throughout most of their range they summer north of the tree limit, but in winter sometimes penetrate a hundred miles or more into the northern border of the timber. All the species have two annual molts, and, save for the tips of the ears, are pure white in winter. The summer pelage is usually gray or brown. The Arctic Hare swims freely across the small streams which in spring traverse the Arctic barrens in all directions. This handsome animal is the main diet of many larger beasts of prey; and has often saved the life of man himself. The Indians and trappers in the Far North have for years depended on it for food on many a forced march. At the same time it is not always easy to capture. Its white coat enables it to rest serenely in its "form," often unseen by the searching eye of owl or gyrfalcon, while its speed enables it to show a clean pair of heels to its pursuers in many a chase by the Blue Fox, Wolverene, Lynx or Gray Wolf. It feeds mainly on lichens and stoneworts and the twigs of alpine plants.

The Hudson Bay, or Hoary, Hare, a still smaller species, is found in the barren grounds from Fort Churchill northwards, and is distinguishable from the type mainly by its gray summer pelage. Mr. Edward A. Preble states that "in winter they migrate to a slight extent, reaching the neighborhood of York Factory and perhaps farther." Describing his search for specimens of this Hare, he says: "I had walked several miles before my attention was attracted by what at first appeared to be a boulder on which a small restless bird was perched. A second glance showed that the object was an Arctic Hare, whose ears, twitching slightly, completed the resemblance that had deceived me. Another was afterward started from beneath a dwarfed willow near by. Both were secured, and proved to be males, evidently young of the year, but full grown."

The *Greenland Hare* ranges over the northwestern coasts of Greenland and Ellesmere Land, its distribution coinciding largely with that of the northern Musk-ox. It is larger than the Arctic Hare, and its summer pelage is white suffused with light tawny. It is remarkable for its excessively heavy fur, the thickness of which "gives the coat a woolly or fleece-like effect. The young (which are about one-third grown in July) have an odd resemblance to very young lambs, owing to their dingy-whitish woolly coats. This Hare has very stout claws and extremely long, outreaching incisors — characters not approached by any of its known relatives.

The *Alaska Hare,* a habitant of the tundras of northern and northwestern Alaska, except the peninsula and the Bristol Bay section, is the largest of all the American Arctic Hares. It has very large feet, and is of a darker brown in summer; but in winter becomes pure white except for the black tips on its ears.

VARYING HARE

Lepus americanus *Erxleben*

Other Names.— American Hare, Snowshoe Hare, White Hare (or "Rabbit").

General Description.—A good-sized rodent with large ears, long legs and very short tail. Head broad; nose blunt and rounded; eyes large; ears exceedingly large, thickly covered with short hairs; body of good size; tail very short; legs long, hind legs longer than fore legs with much larger feet; soles of feet exceedingly hairy; toes, five in number on fore feet, four on hind feet; pelage of two coats, a shorter underfur and a longer outer coat. Generally an animal of timid, nervous temperament.

Dental Formula.— Incisors, $\frac{2-2}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{3-3}{2-2}$; Molars, $\frac{3-3}{3-3}=28$.

Pelage.— Adults: Sexes identical. *Summer.* Above, reddish or cinnamon-brown darkest along the back; beneath, white; ears tipped with black posteriorly, the black extending down toward the margin; anterior edge of ear white; tail above sooty-brown, beneath grayish; throat except extreme upper part of chin, brownish-buff. *Winter.* White everywhere, except tips of ears which are black, the hairs having a narrow middle band of reddish-brown. Young: Similar to adults but much grayer.

Measurements.— Total length, 19 inches; tail vertebrae, about 1.5 inch; hind foot, 5.5 inches. Weight about 3 pounds.

Range.— From southern end of Hudson Bay to southern Keewatin, Mackenzie, most of Saskatchewan, Manitoba east through northern Ontario, northern Quebec through Ungava and Labrador, south into United States to Michigan north of Saginaw, and west to Wyoming.

Food.— Almost any green vegetation or bark of trees.

Remarks.— The Varying Hare is representative of a group of 12 species and subspecies, also commonly known as Snowshoe Hares because of the large track they make in the snow. These animals are true Hares and are closely related to the Arctic Hares and to the large Jack "Rabbits" or Plains Hares. In classifying this small group of Hares considerable emphasis has been laid upon cranial structures, but correlated with these we find certain variations in size and color as well.

Related Species

Varying Hare.— *Lepus americanus americanus* Erxleben. Typical animal as described above. Most of eastern half of Canada, west to Saskatchewan, and south to Michigan and Wyoming.

Minnesota Varying Hare.— *Lepus americanus phaeonotus* Allen. Smaller, paler and buffier than the typical Varying Hare. Northern Michigan, Wisconsin, Minnesota and into western Ontario and southern Manitoba.

Virginia Varying Hare.— *Lepus americanus virginianus* (Harlan). Largest and most richly colored of the Varying Hares. In summer rusty-brown above. Mountains of West Virginia and Virginia, north through eastern United States to Maine and extreme southern Ontario.

Nova Scotia Varying Hare.— *Lepus americanus struthopus* Bangs. Hind foot shorter; color darker than the typical Varying Hare. Nova Scotia, New Brunswick, Quebec and Newfoundland south to Maine.

MacFarlane's Varying Hare.— *Lepus americanus macfarlani* Merriam. Larger than the typical form with longer ears; dusky-gray above. Wooded parts of Alaska, base of Alaskan Peninsula, Yukon Territory, western Mackenzie, northern British Columbia and northwestern Alberta.

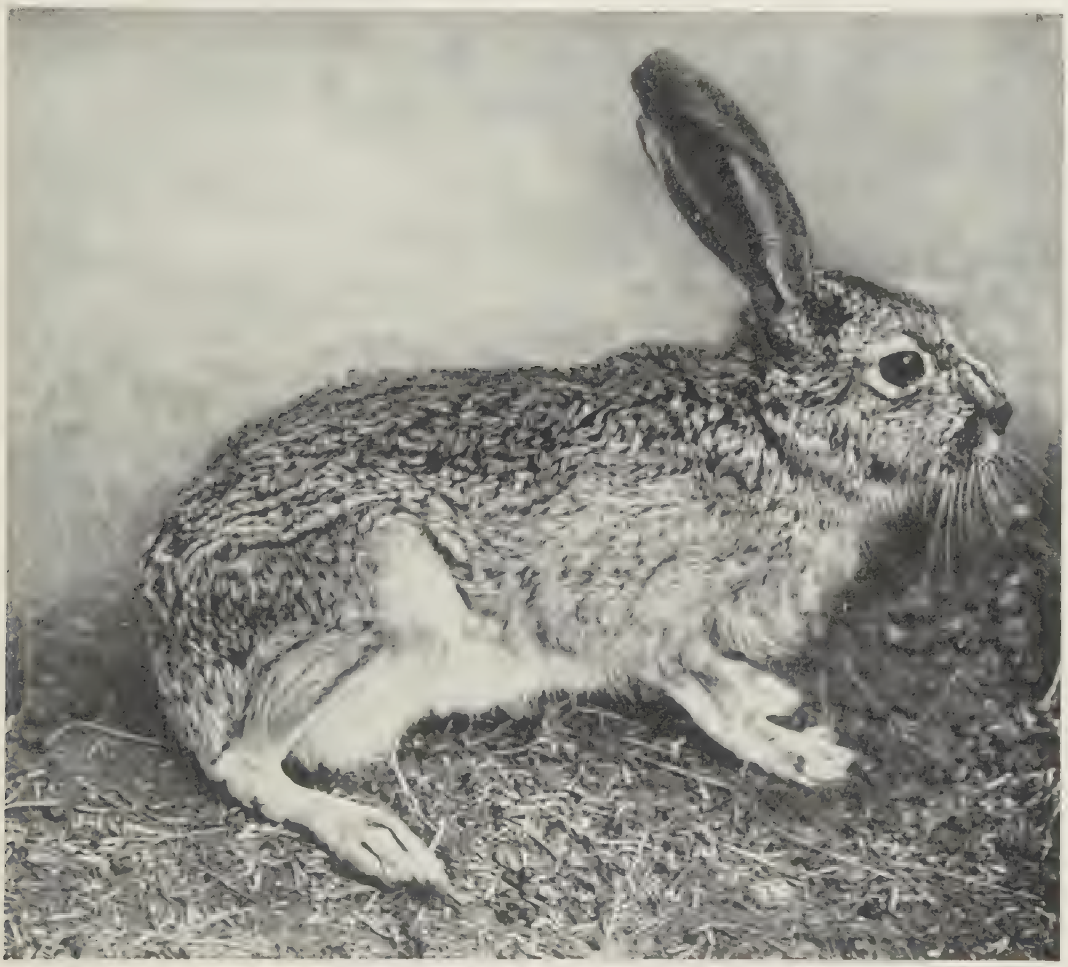
Baird's Varying Hare.— *Lepus bairdii bairdii* (Hayden). Size large; pale grayish-brown mixed with black. Higher parts of Rocky Mountains from Idaho, Montana, eastern Washington and Oregon, south to central New Mexico, and north to southern Alberta and British Columbia.

Washington Varying Hare.— *Lepus washingtonii washingtonii* Baird. Small; a dark reddish form with little or no white; does not turn white in winter. Washington northward to Fraser River, British Columbia; and from the west slope of the Cascade Mountains to the sea.

"Varying Hare, the books call him; and he takes his changeable color-notions, perhaps, from the swamps, wearing in summer the brown of their slow water — brown with just a hint of blue in it — but remembering always the waxy white of the blossom-heads above him. Half alien he seems to these months of heat, and he is seen then — if seen at all — as a typical "limping hare" of the poets, lean and listless, with small suggestion of his winter vigor. Yet he plies a sure activity, in the green cover, harboring his queer, big-headed young in secret surface nests, and cutting clean paths on which he and they may reach with ease the choicest feeding-grounds far up the barrens, or flee back to the quick safety of the swamps. Forking and crossing and fading into nothingness, these paths are the surest clue to his presence, summer and winter." Thus writes Edward A. Briggs, in *Field and Stream,* who continues:

"If the first frost spells joy to other fur-bearers, the big hare finds in it a tang of ecstasy. Essentially a northern breed, his kind range even to the Arctic circle; the Canadian timber swarms with him; generations of New England boyhood have snared him in his paths.

"When the brief October flare has died down to iron and ashen November, he works his miracle, whereby to pay due homage to the North. The snows are just ahead; and was he not born beneath a snowy rhododendron bloom? It is a true miracle, not complete in an hour or a day. First, the merest silvering on his brown sides; then a growing pallor that smothers him in a smoky drab, but leaving transient blots and splashes of brown along his spine and especially



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PRAIRIE HARE

Known also as the White-tailed Jack "Rabbit." A very large Hare with extremely long, mule-shaped ears

on his forehead and upper cheeks, for all the world like the spotted circus ponies of one's childhood; last of all, ermine-white. Not the trimness of the winter Weasel, however, nor the smooth ivory of your pink-eyed Easter bunny, but a loose-brown fluffiness, careless yet beautiful, and a sure duplicate of light-piled snowflakes that have zigzagged down through the brush. With their first fall he matched the twig-pierced blanket laid upon the thicket floors; by mid-December he moves across the drifts intangible as a flying cloud-shadow. Right in the dazzling open he may pause, and the gun that flew up to cover him is lowered, the eye peering uncertainly, to find him gone — or sitting there still, white of whiteness.

"Close at hand he reveals one unexpected lingering of color; his alert, expressive ears — rounded and not too long, a true woods ear — are tipped and edged with black that never alters. The reason is baffling, but once discovered it is a very triumph of mimicry. For as he crouches beneath a shrub his ears are folded along his neck and throw a shadowing color there, just as every rounded snow-hummock is somewhere crossed with shadow from the twigs above.

"At times his pelage plays him false. The harlequin half-way coat cannot but advertise his movements, though at rest it is obscure enough; and now and then winter grows faint-hearted and leaves him white — prominent in a world of grays and browns. But he takes his troubles philosophically, sticking to cover with closer persistence, and biding the near time when he may drift invisible again across the snows."

The Varying Hare changes his coat twice a year, in spring and autumn,— hence his name. He is often called "Snowshoe Rabbit," because the elongated track he makes in the snow looks like a diminutive snowshoe track. The popular story that he changes his coat in a single night or with the first snowfall is untrue. The change is gradual and accomplished by shedding and new growth. There are two Hares in this group, the Washington Varying Hare and the Oregon Snowshoe "Rabbit," whose coats do not turn white in winter. It is worth noting that most of the southern forms in the summer coat have the upper part of the hind feet brown similar to the body, whereas the northern and the high mountain Hares have the tops of the hind feet white.

The Varying Hares occupy a greater stretch of territory than any other group, ranging from the Atlantic coast to the Pacific, and to the shore of Behring Sea in Alaska; and as far south as Virginia in the East and New Mexico in the West.

Mr. Edward A. Preble found them abundant in the Athabaska region of Canada. "While descending the Athabaska and Slave rivers we saw large numbers of Varying Hares," he states. "In many places along the banks the dense thickets of willows and other shrubs had been eaten almost down to the ground. On the Smith Portage road their ravages are especially noticeable, the young Banksian pines being here their principal food. The many evidences of winter snaring, and the thousands of white 'rabbit' skins which littered the neighborhood of an occasional deserted Indian camp, showed that this locality had been a favorite resort for both 'rabbits' and Indians during the preceding winter." In this district, each Indian, and some of the white inhabitants, maintained what was known as a "rabbit track." This was a trail extending for several miles with snares set at frequent intervals. "A pole to which the noose is attached is balanced over a convenient limb and tips up when the snare is released, suspending the animal in midair. This insures a speedy death and places the quarry out of reach of dogs and other predatory quadrupeds. They freeze in the snares and are kept for weeks and months in this state without deterioration, and figure extensively on the winter bill-of-fare at the northern trading posts."

Varying Hares are a favorite prey of the bald and golden eagles, several of the hawks, and the snowy, great-horned, and some other owls, while among their four-footed foes must be reckoned the lynx, wolf, fox, sable, mink, weasel and ermine, besides domestic dogs and cats. Indians use the skins for robes, mittens and caps. The Dogribs lure the animals within rifle range by making a kind of rasping squeak. Preble "easily learned to imitate the sound, and soon became a proficient rabbit caller. The method is successful only during the breeding season. Adults of both sexes are attracted by the sound, but the young seldom respond to it." This is a curious analogy to Moose-calling.

These Hares are subject to several diseases; and epidemics, recurring about every five or six years, often reduce their numbers to the verge of extermination. Major A. E. Snyder, writing from the Yukon, of the results of one such epidemic, says: "The disease has evidently spent itself and only the healthy rabbits are left. In a journey recently of twenty days' duration, I saw only two; in other words, where there were thousands two years ago, they are in ones and twos now."

The Varying Hare, however, is gifted with numerous families (like others of its tribe) and soon renews the population. It has three litters during the summer, with two or three young in each litter. Mr. Preble noted that, in spite of disease, of unlimited snaring by the Indians, and of the attacks of their animal foes, when spring arrived the Hares were found to be "fairly abundant."

Photograph by J. H. Field

YOUNG WILD RABBITS

An unusual and interesting picture secured by a keen-eyed field observer. It shows a nest of three Rabbits only eight days old

The *Virginia Varying Hare* is the largest, brightest, and most richly colored form. It is about twenty inches long. Its summer coat is of a rusty brown with a wash of black heaviest on the back; under parts white. In winter, in the southern parts of its range, the pelage is sometimes partially brown, instead of pure white as in other forms. Of the feeding habits of this Hare, Mr. Witmer Stone says: "As soon as they are able to take care of themselves, or even before, judging from outward appearances, the young ones are turned adrift to support themselves as best they may. The matter of finding food at that season is easy enough, but to avoid the numerous enemies that beset them must be much more difficult, and I doubt if one out of a dozen ever attains its growth." They feed voraciously upon the bark of young trees, twigs, buds, and shoots, reaching up to some distance on their long hind legs; but it never seems to occur to them to carry any of it away to the cover of the evergreens where they sleep, and in consequence they are obliged to be abroad in all kinds of weather or go hungry until the storm is over. They usually pass the day crouching motionless, half asleep in the shadow, though not averse to sunning themselves at midday, especially during the latter part of the winter. Toward sunset they start out in search of food and are back in their forms again soon after sunrise, but whether they spend the entire night in feeding, or only the hours of twilight, is not easy to determine.

This Hare is a habitant of the mountains of West Virginia and Virginia, and is found as far north as Ontario. In the Adirondacks it has been found at an altitude of 4000 feet. In many districts the northern extension of the range of the Cottontails is restricting the area occupied by Varying Hares; the latter have almost disappeared from the State of New Jersey.

Baird's Hare is interesting as being one of the largest of the species, and also the most southern in its range. It lives in the higher parts of the Rocky Mountains from Great Slave Lake south to central New Mexico. In northern New Mexico and Colorado it has been seen at an altitude of 11,000 feet. It is of nearly the same size as the Northern Varying Hare, but its ears and hind feet are longer. Also it is more dusky in summer, the feet are usually pure white, and the deep reddish cinnamon of the head contrasts strongly with the dusky color of the body. In winter the coat is entirely white, except for a narrow dusky border to the ear tips, which is noted in other species.

WHITE-TAILED JACK "RABBIT"

Lepus campestris *Bachman*

Other Names.— Prairie Hare, Plains Hare.

General Description.— A very large Hare with long robust hind legs, and a conspicuous white tail. Head fairly large and broad; eyes large; ears very large and shaped somewhat like those of a mule; body robust; tail fairly long for a Hare, broad and bushy; hind legs decidedly longer than fore legs; general color gray to grayish-brown above, pure white below; pelage quite long and soft. An animal of the open fields or prairies.

Dental Formula.— Incisors, $\frac{2-2}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{3-3}{2-2}$; Molars, $\frac{3-3}{3-3}=28$.

Pelage.—ADULTS: Sexes identical. *Summer.* Entire upper parts, sides of legs, throat and band across chest yellowish-gray mixed with dark-brown; sides clearer gray; nape smoky white; undersurface of head and belly white; legs gray, tinged with rusty; below clear white; fringe and border of ears white; tip of ear jet-black inside and out. *Winter.* Pure white except for black marks on tips of ears. YOUNG: Similar to adults but more uniform slaty-gray.

Measurements.— Total length, 24 inches; tail vertebrae, 4 inches; hind feet, 6 inches. Weight 7 pounds.

Range.— Great Plains of Alberta, Saskatchewan and Manitoba south to Montana, Wyoming, the Dakotas, Minnesota, Iowa, Nebraska, northern half of Kansas, Colorado east of Rockies, and northern New Mexico.

Food.— A variety of green vegetation, bark and twigs.

Remarks.— There are only three subspecies of the one species in this group, known as the White-tailed Jack "Rabbit" group. Although frequently found in regions with other Jack "Rabbits" belonging to the Black-tailed Group, these animals may be distinguished at a glance not only by their larger size and conspicuous white tail, but also by certain peculiarities of habit.

RELATED SUBSPECIES

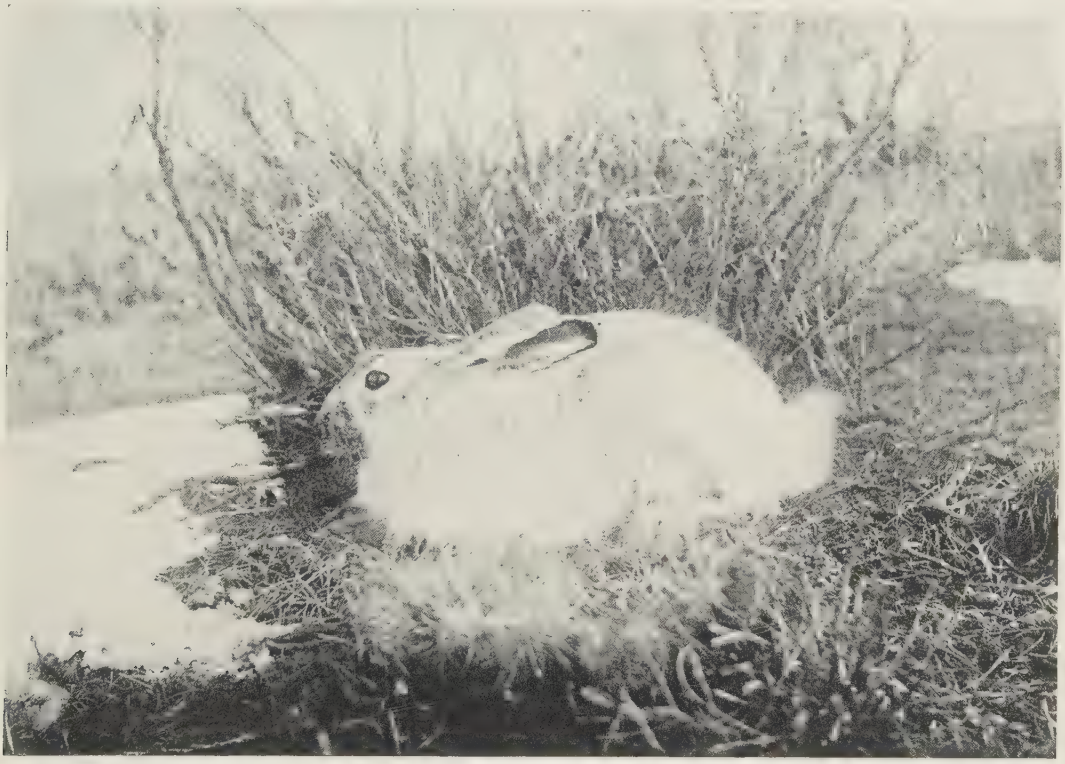
White-tailed Jack "Rabbit."— *Lepus campestris campestris* Bachman. Typical animal as described above. Great Plains region from Saskatchewan and Manitoba south, east of the Rocky Mountains, to northern New Mexico, and east to Minnesota and Iowa.

Townsend White-tailed Jack "Rabbit."— *Lepus campestris townsendii* (Bachman). Smaller, paler, and with less black on the ears. Great Basin region from east slopes of Cascade range to Rocky Mountains in eastern Washington, Oregon and California; north to British Columbia and east to Idaho, southwestern Wyoming, Utah and Colorado.

Sierra White-tailed Jack "Rabbit."— *Lepus campestris sierrae* Merriam. Largest of the three subspecies, pale and with much black on ears. High slopes of Sierra Nevada of California.

Although called the Prairie Hare, this species is found also on mountain slopes at altitudes of 10,000 to 12,000 feet on both the Sierra Nevada and the Rocky Mountains. Its range extends from middle Kansas northward to the plains of the Saskatchewan, Canada. It is a large Hare, its total length being about two feet. It has a long and silky fur, exactly the color of the sand and the dead leaves under the bushes where it makes its forms. In these forms the Prairie Hare rests for hours at a stretch apparently indifferent to danger, but really always on the alert. Dr. Coues doubts whether it ever stands erect with its forepaws off the ground. When squatting on its haunches, in a listening attitude, one fore foot is advanced a little before the other, and the ears point in opposite directions. It is an exceedingly agile animal, and its mode of progression is a series of leaps and bounds. It starts off with a great bound, and, says Dr. Coues, "the instant it touches the ground it is up again, with a peculiar springy jerk, more like the rebounding of an elastic ball than the result of muscular exertion. With a succession of these high jerky leaps the animal makes off, generally in a straight course; there is nothing of the dodging or scuttling about that marks the running of the smaller Rabbits."

These Jack "Rabbits" do not occur in such numbers as the Black-tailed species. Dr. Coues says it is not in the least gregarious. "I have never seen nor heard of several together," he states, "and indeed it is rare to find even two together, at any season whatever. It is one of the most solitary animals with which I have become acquainted. If it has any preference however, it is for 'weedy' tracts, of which the sage-brush regions furnish the best examples; there it finds shelter, which the low, crisp grass of rolling prairie does not afford, and doubtless also secures a greater variety of food."



Photograph by S. Brunner

JACK "RABBIT"

In its winter coat — pure white except for tips of ears. While really a Hare, this rodent is universally called a "Rabbit"

Opinions differ as to the frequency with which the Prairie Hare breeds; but Dr. Palmer states that the evidence available "not only fails to substantiate the view that Jack Rabbits breed every six weeks in the year, but there is every reason to believe that each species has a regular breeding season and a definite period of rest." The young, usually four, occasionally six, are born in June or July.

Inasmuch, however, as a commission house in Saint Paul, Minn., handled 12,000 Jack "Rabbit" skins from North and South Dakota, where the White-tailed is the only species, it is evident that they must be fairly abundant in some districts.

WHITE-SIDED JACK "RABBIT"

Lepus alleni *Mearns*

Other Names.— Allen's Jack "Rabbit," Antelope Jack "Rabbit."

General Description.— A very large Hare with extremely large ears and hind legs, white mottled sides, black tail. Head large and broad; ears enormous, well-clothed with short hair; body large; tail short, marked with black; pelage quite long and thick. A desert animal.

Dental Formula.— Incisors, $\frac{2-2}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{3-3}{2-2}$; Molars, $\frac{3-3}{3-3}=28$.

Pelage.— ADULTS: Sexes identical. Seasonal variation not especially conspicuous. Above yellowish-brown mixed with black; nape of neck fulvous; sides, hips, rump and outside of legs white mixed with black, giving a salt and pepper effect; a fulvous band across chest, rest of underparts white; head, pale yellowish-gray; feet above white; tail above like back but with a line of plumbeous-black extending onto it from the rump, beneath white; ears whitish with white fringe. YOUNG: Very similar to adults.

Measurements.— Total length, 26 inches; tail vertebrae, 2.5 inches; hind feet, 5.5 inches; ear from notch, 6.2 inches.

Range.— Desert plains of southern Arizona south into Mexico.

Food.— Desert vegetation.

Remarks.— Allen's Jack "Rabbit" typifies one of the most highly specialized groups of North American Hares. This group contains some 12 species and subspecies to be found north of the Rio Grande, most of which have the characteristic black tail, and for this reason are known as Black-tailed Jack "Rabbits." None of this group becomes white in winter, and all are desert or semi-arid plains types. Classification of this group is based to a considerable extent on cranial characters which are correlated often with noticeable variations in color and in proportions of different parts.

RELATED SPECIES AND SUBSPECIES

Allen's Jack "Rabbit."— *Lepus alleni alleni* Mearns. Typical animal of the above description. Desert plains from southern Arizona south into Mexico.

Sinaloa Jack "Rabbit."— *Lepus alleni palitans.* Bangs. Skull largest of American Hares; ears long; tail less black above; sides of head and back bright cream to pinkish-buff. Pacific Coast to Mexico.

Gaillard's Jack "Rabbit."— *Lepus gaillardi gaillardi* Mearns. Ears enormous; above pale ochraceous-cinnamon mixed with black; tail above, black with many white-tipped hairs. Grassy plains of southwestern New Mexico southward.

Also see Black-tailed group which follows.

The White-sided Jack "Rabbits" are perhaps the most striking and the handsomest of all the North American Hares. They differ from others in having the sides mottled white, the hindquarters being usually gray, and no black patch on the back of the ear-tips. In Nelson's opinion, "it is safe to assume that the white on the sides serves the same purpose in all these species. By means of muscles the skin of either side can be drawn over the back at will. In this manner the buffy or brown dorsal area is shifted more or less completely to one side and the white on the opposite side is drawn nearly or quite to the median line. This habit has been observed when the Hares were standing, or moving along at moderate speed, usually after they had been driven from their forms. This enlargement of the white area is always on the side turned toward the chance intruder, and accordingly alternates from side to side as the animals slowly zigzag away. In the bright sunlight the snowy white side flashes brilliantly, attracting attention from afar, and affording a fine example of directive coloration."

This group of Jack Rabbits ranges from the southern portion of the State of Arizona and the extreme south of New Mexico to beyond the isthmus of Tehuantepec. It may in fact be considered a Mexican group. Individuals are found at sea level and at various altitudes up to about 8500 feet. They live commonly on open plains.

Allen's Jack "Rabbit" is one of the largest and handsomest of the White-sided group. It is about twenty-six inches in length, has enormous ears, long and slender legs, and, with the exception of the Sinaloa Jack Rabbit, the largest skull of any American Hare. The strikingly bright color of its coat completely differentiates it from the other species. It has been noticed that the richness of coloration increases in intensity to the southward, while "the pale typical form is limited mainly to the hot plains of southern Arizona."

Concerning its habits, Mr. W. W. Price says: "This splendid Hare is abundant about Tucson and in lower portions of the desert belt. It is somewhat shy, and hard to secure, except with a rifle. One rarely comes upon it suddenly. It has a slow, apparently awkward gait, but its leaps are long, and it gets over the ground with surprising rapidity."

LYING LOW

A familiar attitude of the Jack "Rabbit," when trying to escape observation

The subspecies known as the *Sinaloa Jack "Rabbit"* is even handsomer than Allen's Jack "Rabbit," the sides of the head and the back being of a much richer and brighter cream-buff or pinkish-buff; the tail has less black on the upper part; and the skull is larger than that of any other American Hare. It ranges along the Pacific Coast from Sonora to northern Tepic, the most intensely colored specimens coming from Alamos, southern Sonora.

The *Gaillard Jack "Rabbit"* is one of the rarest. In size and general appearance it resembles the type species. It is found over a comparatively limited area, occurring mainly along the eastern basal slopes of the Sierra Madre in Chihuahua, extending thence over the immediately adjacent part of the grassy plains and westward into the open pine forest of the Sierra Madre. In this forest it is rare up to 7000 feet, and the few found there were probably merely stray summer residents.

BLACK-TAILED JACK "RABBIT"

Lepus californicus *Gray*

General Description.— A large Hare with ears a trifle smaller than the White-sided Hare. Head large; body heavy; legs very long; pelage long and thick. A desert animal.

Dental Formula.— Same as White-sided Hare.

Pelage.— Adults: Sexes identical. Seasonal variation not marked. Above, yellowish-brown mixed with black; sides, rump and thighs tinged with cinnamon; tail above black, the black extending onto rump; beneath pale buff.

Measurements.— Total length, 28 inches; tail vertebrae, 2.6 inches.

Range.— The California deserts.

Food.— Desert vegetation.

Remarks.— Classed with the group typified by Allen's Jack "Rabbit," which are characterized both by the white side and black tail. All are nearly related, but for ease of reference the other members of the Black-tailed group are here considered together.

Related Species

California Black-tailed Jack "Rabbit."— *Lepus californicus californicus* Gray. Typical animal described above. Desert plains of California.

Columbia Black-tailed Jack "Rabbit."— *Lepus californicus wallawalla* (Merriam). Above gray mixed with black; sides clearer gray; tail above black. Northeastern California, northwestern Nevada, and north through eastern Oregon and Washington.

Great Plains Black-tailed Jack "Rabbit."— *Lepus californicus melanotis* (Mearns). General color above, bright fulvous with no gray or ashy; body with blotchings of black; ears mixed brown and black anteriorly; tail above black. Great Plains from Texas and New Mexico north to Dakota and Nebraska west to the Rockies.

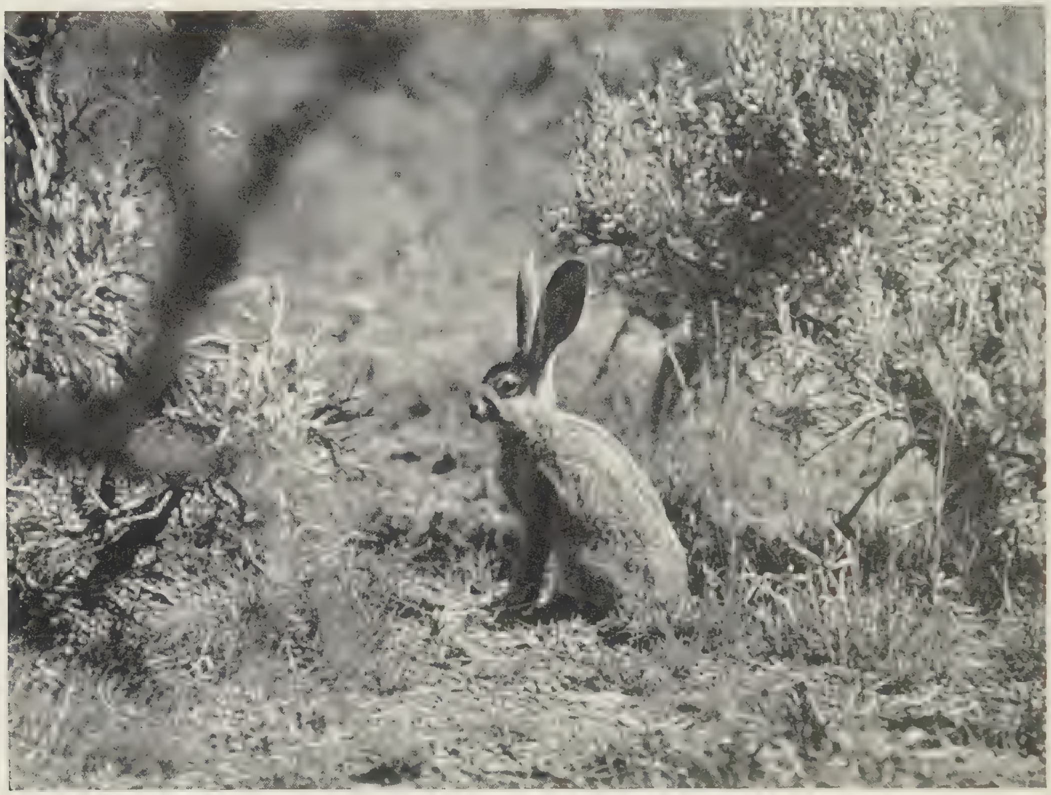
Texas Black-tailed Jack "Rabbit."— *Lepus californicus merriami* (Mearns). Ears quite large; color above, grayish mixed with black; underpart white; nape of neck black; tail above black. Southern Texas.

In several respects this is the most important group of all our Hares. The territory occupied by its members is simply enormous; the losses resulting from its depredations on crops, garden truck, and trees and shrubs aggregate thousands of dollars annually, and constitute one of the most serious among the many problems which the American farmer has to grapple with; and the large traffic in the animal, both as a source of food and for its fur, gives it considerable economic prominence.

Our Black-tailed Jack is an ubiquitous animal. From southeastern Washington down to the Valley of Mexico, from Kansas and Texas to the Pacific Coast, and even on the remote islands of Lower California, he is to be found in possession. The widest ranges of temperature do not bother him; he is equally comfortable on the scorching plains and deserts of the West, and on Mexican Mountains 8000 feet or more above the level of the sea. Scarcity of food causes him no anxiety; for he can thrive where many another animal would starve. Even his enemies, and they are many, can gain only a temporary advantage over him; for in spite of the attacks of beasts and birds of prey, of the pursuits of sportsmen in search of game, and of hunters in search of State bounties for his destruction as vermin, not to mention epidemics carrying off thousands of his race, the Black-tailed Jack "Rabbit" continues to survive and flourish.

Unlike the Cottontails, the Jack "Rabbits" do not live in burrows. They make their forms or nests in patches of grass, under the low branches of trees, in tufts of shrubs, or any similar place where they can find protection from the weather and bring forth their young. In the Little Colorado Desert, for instance, they may be found in the intense heat of the day under the juniper, or in the greasewood, squatting perfectly motionless with their long ears laid flat upon their backs, "their color harmonizing so well with their surroundings that they are rarely seen until they start with a great bound and gallop swiftly away." Dr. T. S. Palmer says that certain shrubs in the West "are commonly known as 'rabbit brush' because they grow in dense thickets in which 'rabbits' are fond of hiding." Where there are no bushes, the animals seek the shade of any object to shelter them from the burning sun; and on the Southern Pacific Railroad, these Hares may sometimes be seen "crouching in the shadow of the telegraph poles, evidently alarmed by the train, but uncertain whether or not to forsake their shady spots and seek safety in flight." It may be noted here that Jack "Rabbits" do not turn up the tail like Cottontails, so that the color of the upper surface, whether white or black, can easily be determined even at a distance.

There are very few positive data available as to the breeding habits of Jack "Rabbits," but Dr. Palmer, from the examination of very



Photograph by H. E. Anthony

COLUMBIA BLACK-TAILED JACK "RABBIT"

The protective coloring of this animal among the sage and mesquite is well shown young animals, has been able to arrive at certain information. He says: "The length of the breeding season in southern regions indicates that several litters are born each year; but in the northern United States the number is probably not more than two, or, at the most, three." The earliest date of birth is about the beginning of January (in desert region of southern California and southern Texas); the latest, September (Arizona, Texas and Chihuahua). Most of the young seemed to be born in April, May and June. The number of young in a litter were: California Jack "Rabbit," four; Texas Jack "Rabbit," one to six; Great Plains Jack "Rabbit," one. It should, of course, be remembered that these figures were based on comparatively few specimens.

To dwellers in the East, the numbers of these animals seem incredible. Mr. Alvah H. Eaton, speaking of their ravages in Fresno County, California, says: "It was no uncommon thing to start 1000 rabbits out of a patch of weeds, and in one patch about a quarter of a mile long there were at least 5000. From 20,000 to 25,000 of these animals are sometimes destroyed in a single battue or drive." When wild feed gets scarce, they invade the cultivated areas, if there are any near. All growing grain crops receive especial attention from them; apple and plum trees, raspberry and grape vines, melons, cabbage and carrots — all come alike to them. In Texas, Mr. W. J. Crowley reports "that they cause considerable injury to grain, and in fields of wheat, oats and cotton often cut paths twelve inches wide, and 300 or 400 yards in length, and destroy patches as large as an ordinary sized room." Whitewashing the bark of peach trees does no good, as "the rabbits take the whitewash and the bark together." Even timber claims planted in black locust, "large and old enough to 'prove up' on have been destroyed by them."

The *California Black-tailed Jack "Rabbit"* is found in the California humid coast belt from Cape Mendocino south to Gaviota Pass, and inland through the north of San Joaquin Valley, Sacramento Valley, and north to Oregon. It has often been confused with the Texan species, but is browner and darker above, and its underparts are tan color or buff, instead of white, as in the Texan Jack "Rabbit." It is most abundant on the chaparral-covered slopes of the western foothills of the Sierra Nevada. Some idea of the numbers of this Jack "Rabbit" may be gathered from the fact that Modoc County, California, alone, in three consecutive months, paid in bounties (of three cents a head) $876.77 for 27,559 scalps.

Coursing this Jack "Rabbit" with greyhounds is a favorite sport in California and elsewhere. Mr. T. S. Van Dyke writes: "A dash after the Hare on a good horse and behind good dogs is one of the most charming of outings. The horse enjoys the sport as well as the dogs do. The ground flies beneath you, the surrounding mountains swim in a haze, the whole amphitheater seems to turn around while you are standing still. Vainly the Hare twists and sends the dogs spinning ahead in confusion, while he scuds away on his new tack without the loss of an instant, so far as you can see. All ordinary dogs fall out of the race. But if the greyhounds are good and the brush not too near, the Hare's doubling only postpones his end, however untiring his foot, or frequent his twists. Vainly he lays his ears flatter upon his neck and lets out another link of his reserved speed. Before he has made many turns he is caught — perhaps in mid-air — and the dogs and Hare go rolling over in a heap together."

The *Texas Jack "Rabbit"* is a slightly smaller form of the preceding, occurring in northern Durango, Mexico, north through most of New Mexico, northeastern Arizona, to southwest Colorado. It has a long, swinging gallop and is a splendid jumper. At Wichita, Kansas, some of these animals were seen to escape from an inclosure by clearing the fence which was seven feet high. At Fort Whipple, Arizona, Dr. Coues found this species "very common the year round. They chiefly affect grassy meadows and open glades, interspersed with copses, or clumps of oak trees, or patches of briery undergrowth. In the latitude of Fort Whipple the young are brought forth in June."

The Texas Jack "Rabbit" is not a symmetrical animal, nor is he a handsome creature, but "self-preservation is the first law of Nature" and he has wonderful powers of flight. He is not combative; on the contrary, he is very timid. These "Rabbits" are guarded by their invisibility when crouched in the forms, by their keen sense of sight and smell, and by their wonderful acuteness of hearing, for the augmentation of which their great ears have providentially been developed; but if danger comes too near they can usually escape by flight, a word that approaches literal accuracy as a description of a series of bounds, each from ten to fifteen feet in length.

They are very shrewd in throwing a dog off the trail; it is no unusual sight to see one make a run and outdistance the dog, then turn and retrace its steps on a back track for some distance, then give a tremendous leap to one side and squat in the grass until the dogs run by and lose its trail. When in flight they stretch out to their full length and their immense ears extend back perfectly straight.

The Texas Jack "Rabbit" when grown weighs from six to ten pounds, and measures from twenty-eight to thirty-six inches from the points of his long black-tipped ears to the hind toes when stretched out in a "sure enough" run when really frightened. They do not live in groups or communities, but they go upon the principle of every fellow for himself; it is rarely the case that two or more are seen together.

The *Great Plains Jack "Rabbit"* is another variety of the California Jack "Rabbit," ranging from northern Texas to southeastern Wyoming, and even Colorado east of the Rocky Mountains. It has shorter ears and a richer coloring than the California Jack "Rabbit." It is the species most common in the markets of Eastern States. It is speedy, deep-lunged, and obstinate, and is considered one of the best for coursing.

The Jack "Rabbit" has never been much in demand as an article of food until in recent years; it is now served by all of the leading hotels of the South, and many are shipped to northern hostelries, where they are looked upon as an attractive addition to the menu. If taken when half grown the hams and loins are most excellent and are preferred by many to even chicken or venison.

PYGMY HARE

Brachylagus idahoensis (*Merriam*)

Other Name.— Idaho Hare.

General Description.— Smallest of the North American Hares. Head of normal proportions; ears short; body not especially robust; legs, while long, not as long as in other Hares; tail very short; pelage quite long and soft; general color, drab gray mixed with black.

Dental Formula.— Incisors, $\frac{2-2}{1-1}$; Canines, $\frac{0-0}{0-0}$: Premolars, $\frac{3-3}{2-2}$; Molars, $\frac{3-3}{3-3}=28$.

Pelage.— ADULTS: Sexes identical, a noticeable seasonal variation occurring. *Winter.* Above, clear drab-gray, slightly mixed with black hairs; ears pale buff inside, dull buffy-ochraceous mixed with gray and black-tipped hairs outside, bordered anteriorly with black; nape of neck and feet dull ochraceous buff; breast grayish buff; belly whitish along the middle line only; rudimentary tail, above like back in color. *Summer.* Darker than winter; above, gray suffused with buff and intimately mixed with black. YOUNG: Like adults in the summer pelage.

Measurements.— Total length, 11.5 inches; tail vertebrae, .6 inch; hind foot, 2.8 inches; ear, 2.3 inches.

Range.— Sage brush plains of southern Idaho, southeastern Oregon, northeastern California and northern Nevada.

Food.— Plains vegetation.

Remarks.— This animal is unique, there being only the one species in the genus. Compared with its closest relatives in the United States, the Cottontail Rabbits, sufficient differences to justify the separation of the Idaho Hare are seen in the small size, shorter legs and rudimentary tail, as well as cranial characters not so obvious to the layman. For a long time this animal was known merely from a very few museum specimens, and it is only in recent years that anything has been learned of its habits.

This diminutive animal, which might with propriety be termed the Tom Thumb among Hares, being little more than ten inches in length, is an inhabitant of southern Idaho, southeastern Oregon, northeast California, and north and central Nevada. It has short, broad, and woolly ears, and a very short tail. Its legs are very short, and in running it keeps close to the ground and does not leap as do most of the other Hares.

This is a comparatively rare animal, and the scarcity of the specimens collected is explained by Dr. C. H. Merriam in "Results of a Biological Reconnoissance of South-Central Idaho" thus: "That but half a dozen specimens of this little rabbit were secured during more than two months spent in the very center of its abundance seemed very strange to us until we learned, near the close of the trip, two important facts con-

Photograph by H. T. Middleton

YOUNG COTTONTAIL RABBIT

A wild specimen captured when but a few days old cerning its habits, namely, that it is almost exclusively nocturnal, and that it makes its home in deserted holes of the Badger. The only individual I succeeded in shooting was killed at the mouth of a Badger hole just at daylight."

The Idaho Pygmy Hare is the only American species known to dig its own burrows in the ground. Mr. Vernon Bailey states that "it commonly digs burrows, which are aften connected on the surface with well-marked runways."

COTTONTAIL RABBIT

Sylvilagus floridanus (*Allen*)

General Description.—A medium-sized Rabbit with a short tail having a clear white underside, and carrying the tail over the back to show the white. Head fairly large; eyes large; ears of good size, fairly broad; body moderately robust; tail short; legs fairly long but hind legs not excessively longer than fore legs; pelage long, thick and soft; general color buffy gray mixed with black, above; underparts grayish-white. An animal of brushy areas.

Dental Formula.— Incisors, $\frac{2-2}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{3-3}{2-2}$; Molars, $\frac{3-3}{3-3}=28$.

Pelage.— ADULTS: Sexes identical. A seasonal variation occurs but is not especially conspicuous. Above, buffy-gray mixed and lined with black; legs dark-rufous; a broad band across the chest, brownish-buff; ears broadly edged and tipped with black; nape of neck rusty; a white area about each eye; underparts grayish-white; tail above brown, beneath clear white. YOUNG: Similar to adults but lacking strong black and rufous.

Measurements.— Total length, 18 inches; tail to end of hairs, 2.5 inches; hind foot, 3.4 inches; ear from notch, 2.3 inches.

Range.— Florida northward to North Carolina, west to Louisiana.

Food.— A great variety of green vegetation, leaves of shrubs, buds and bark of trees.

Remarks.— The Cottontail Rabbits may be readily distinguished from any of the related Hares and Rabbits by their shorter ears, shorter tail with its conspicuous white under-surface, and also by the pattern of coloration which is not duplicated outside of this group. There are 27 species and subspecies of Cottontails to be found north of the Rio Grande, and also a number that are found south of this river, so it is to be noted that the group is a very large one. This animal responds quite readily to its environment and thus many color differences are seen when animals from different regions are brought together.

RELATED SPECIES

Florida Cottontail Rabbit.— *Sylvilagus floridanus floridanus* (Allen). Typical animal of the above description. Florida, northward to North Carolina, west to Louisiana.

Eastern Cottontail Rabbit.— *Sylvilagus floridanus mallurus* (Thomas). Larger, ears longer, color paler. East of Allegheny Mountains from Long Island, south to the Carolinas, and west to Alabama.

Texas Cottontail Rabbit.— *Sylvilagus floridanus chapmani* (Allen). Size small, sides and rump grayish-white. Middle and southern Texas.

Mearns Cottontail Rabbit.— *Sylvilagus floridanus mearnsii* (Allen). Size large, colors pale. West of Allegheny Mountains from Toronto, Canada, and central New York, west to Minnesota and Michigan; south to Kansas and Illinois.

New England Cottontail Rabbit.— *Sylvilagus transitionalis* (Bangs). Above, russet and wood brown mixed with black; nape of neck, hazel. New England States, south to Virginia and Georgia, north to Vermont, and southwestern Maine.

Nuttall's Cottontail Rabbit.— *Sylvilagus nuttallii nuttallii* (Bachman). Size small, colors pale. Plains and lower mountain slopes of Columbia River basin in eastern Washington and Oregon; also northeastern California, northwestern Nevada and western Idaho. Three subspecies in this group.

Audubon's Cottontail Rabbit.—*Sylvilagus audubonii audubonii* (Baird). Smaller than eastern Cottontail, ears longer; above, pale yellowish-brown mixed with black. Interior of north central California, south to San Francisco Bay.

Arizona Cottontail Rabbit.— *Sylvilagus audubonii arizonae* (Allen). Like Nuttall's Cottontail but smaller, with ears longer and broader, color paler. Deserts of southern Nevada, California and Arizona.

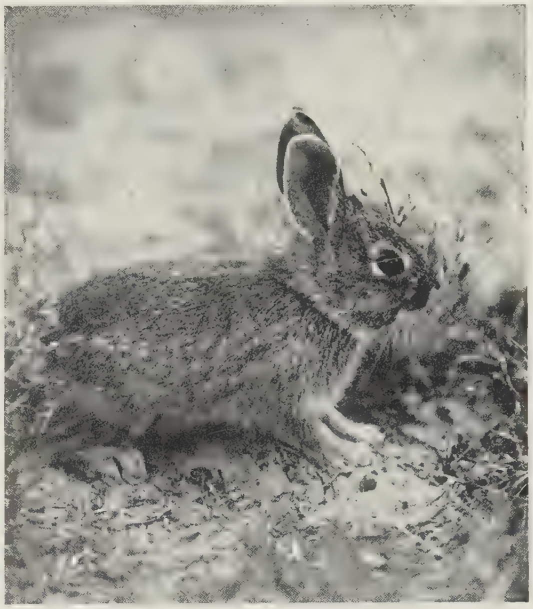
Bailey's Cottontail Rabbit.— *Sylvilagus audubonii baileyi* (Merriam). Large and pale, ears and tail longer. Plains and valleys from eastern Montana through Wyoming, northeastern Utah and Colorado, western North and South Dakota, Nebraska and Kansas.

Gray Cottontail, or Brush Rabbit.— *Sylvilagus bachmani cinerascens* (Allen). Much smaller, ears uniformly gray; above, yellowish-brown mixed with dark brown, general appearance of animal a grizzled gray. It is found in the arid valleys of southern California.

Oregon Cottontail Rabbit.— *Sylvilagus bachmani ubericolor* (Miller). Darkest and richest colored of the Cottontails; pelage very thick. Humid coast belt from northern California north to Columbia River, Oregon.

The Cottontail or Gray Rabbit, is a smaller animal than the Hare, and has, as a rule, shorter ears and shorter and weaker legs. Most of the species make use of burrows, openings in and under rocks, the abandoned homes of other mammals, or, if no dogs are about to chase them, a hole under a house or other building. Their color enables them to lie undetected in a tuft of overhanging grass, or a bunch of briers or bushes. In parts of Texas they live among the big bunches of prickly pears, seeming to ignore the presence of thorns in and along their trails. One of their favorite resorts for a mid-day nap is in or among the big flat pads of a prickly pear, where they will stick to their form until fairly forced out. The Long-eared or Arizona Cottontails make use of Prairie Dog holes to such an extent that the ranchmen call them "Prairie-dog Rabbits."

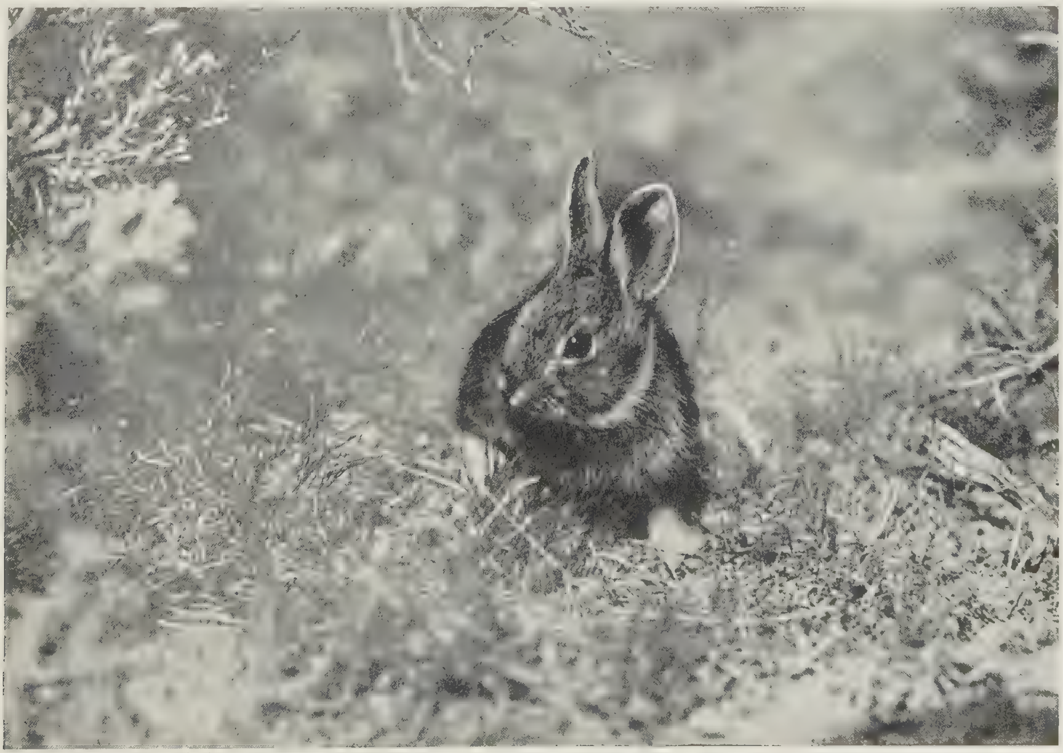
The Cottontail is one of the most familiar objects of our open fields. As the passer-by on a casual stroll comes too near its retreat, away it will scurry, its short, white stump of a tail waving defiance — or, more likely, it is the white flag of truce — for they are at heart timorous creatures. When captured, they will submit to half-taming, but always with a weather eye open to a means of escape. When placed in a cage they do not eat proffered food while their captor is present, but will remain stock-still for minutes, perhaps hours, at a time.



Photograph by H. E. Anthony

NUTTALL'S COTTONTAIL

This is a northwestern species, small in size and of pale color



Photograph by H. E. Anthony

FLORIDA COTTONTAIL

The Cottontail, or Gray Rabbit, is a smaller animal than the Hare

Their favorite food in summer is the inner bark of young trees and shrubs, green twigs, leaves, buds, and berries. As they do not store up food for the winter and do not hibernate, they eke out a rather scanty subsistence in the cold season from occasional wild rose or other hardy berries, and the bark of bushes. By spring they are lean and continually hungry. Indeed, they never seem to get enough to eat.

These Rabbits breed rapidly, often raising three litters in one year. As there are from four to six young at a birth, they would rapidly become a menace, if not kept in check by larger animals and birds of prey.

Photograph by the U. S. Biological Survey

EASTERN COTTONTAIL

This Rabbit and its kindred form a very large family, found in nearly every State in the Union. There are 27 species and subspecies north of the Rio Grande

The species most common east of the Allegheny Mountains from Long Island and the lower Hudson Valley south to Florida is the *Eastern Cottontail.* It is yellowish-brown lined with black above; throat yellowish-gray; fore legs and outside of hind legs rusty; under parts white; tail yellowish-brown above, and white beneath. The females of this and most of the other species make soft, warm nests of fine grass, leaves and other vegetable material, lined with hair from their own bodies, and in these the young are born and lie concealed, like mice in a nest, while small and helpless. But they speedily gain strength and agility.

The *New England Cottontail* ranges the New England States to Maine and southwest to Virginia; also along the Alleghenies through West Virginia to Northern Georgia. It is of a size about equaling the Florida Cottontail, and differs from all other species in the almost uniform pinkish buff of its upper parts. It is increasing its range, and in certain parts of Vermont is slowly driving out the Varying Hare.

Audubon's, or Sacramento Valley Cottontail the typical Western Cottontail, is found in the interior of north-central California from Sacramento Valley to San Joaquin Valley, and reaches the coast on the east and south sides of San Francisco Bay. It is a rather large Rabbit, dark ochraceous brown on the upper parts, and with most of the under parts pure white. It is characteristic of arid open plains, where it occupies not only the deserted holes of other mammals, and crevices in stone walls and rocky ledges, but even the space under floors of outbuildings about ranches. Families of six and eight of this species were found by Nelson living under deserted ranch houses.

SWAMP RABBIT

Sylvilagus aquaticus (*Bachman*)

General Description.—A good-sized Rabbit living in low, swampy woods and bottom lands with neither ears nor hind legs conspicuously elongated. Head small; ears short for a Rabbit; body of normal proportions; tail very short; legs long, hind legs longer than fore legs but not so much so as in the Prairie Hares; incisors very large; pelage harsh but thick; general color above ochraceous-brown, below white.

Dental Formula.— Incisors, $\frac{2-2}{1-1}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{3-3}{2-2}$; Molars, $\frac{3-3}{3-3} = 28$.

Pelage.— ADULTS: Sexes identical. Seasonal variation slight. General color above, ochraceous-brown lined with black; sides paler and with less black; breast dark yellowish-brown; chin and belly white; tail above dark reddish-brown, beneath white; a black spot on forehead; feet dark chestnut-brown; ears dark brown bordered with white in front, with fulvous behind; sometimes a black patch on cheeks; nape reddish-brown. YOUNG: Similar to adults.

Measurements.— Total length, 20.5 inches; tail vertebrae, 2.7 inches; hind feet, 4.2 inches.

Range.— River bottoms and swampy woods from Georgia west to middle Texas, and north to Oklahoma and Illinois.

Food.— Various plants and green vegetation.

Remarks.— The Swamp Rabbits are a well outlined, though small, group of North American Rabbits, separated from their kindred largely on the basis of cranial characters, but also by such superficial details as the shorter ears, tail and hind feet and the harsh pelage. Four species and subspecies of Swamp Rabbits are found north of the Rio Grande.

RELATED SPECIES

Swamp Rabbit.— *Sylvilagus aquaticus aquaticus* (Bachman). Typical animal as described above. Georgia north to southern Illinois, and west to middle Texas.

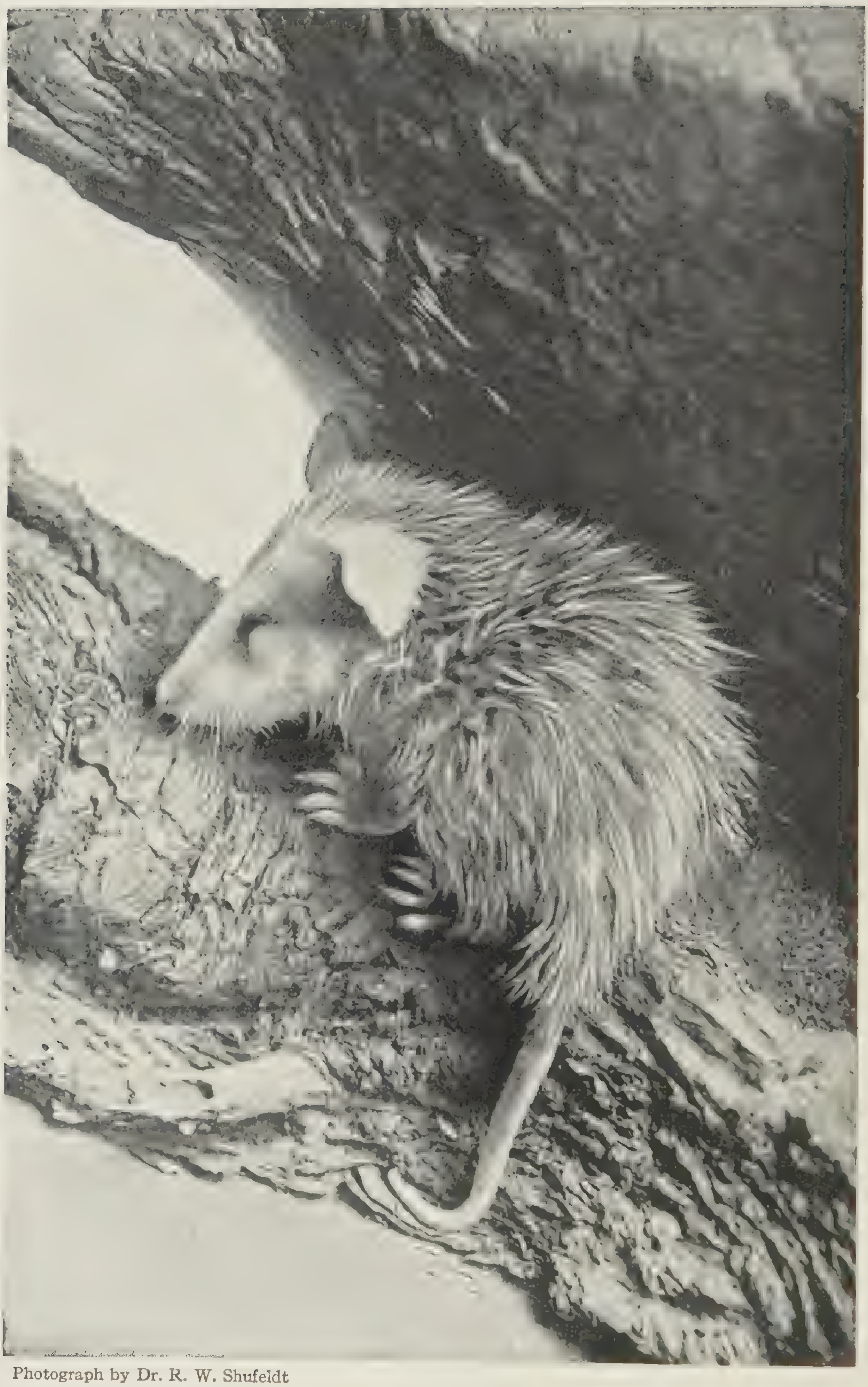
Coast Swamp Rabbit.— *Sylvilagus aquaticus littoralis* Nelson. Redder and darker. Narrow belt of swamps and marshes along the Gulf coast from Mississippi through Louisiana to Matagorda Bay, Texas.

Carolina Swamp Rabbit.— *Sylvilagus palustris palustris* (Bachman). Smaller and with under side of tail grayish instead of white. Lowlands along rivers and coast from North Carolina south to Florida.

Marsh Rabbit.— *Sylvilagus palustris paludicola* (Miller and Bangs). Dark reddish-brown with short broad ears. Peninsular Florida.

As its name implies, the Swamp Rabbit dwells among the bogs, swamps, and bottom-lands, and is thus not so well known as its cousins of the uplands. It is one of the most water-loving of the Rabbits, taking readily to water for food or to escape pursuit. In Texas, Vernon Bailey says, "they live in swamps, marshes, and low, brushy woods near the bayous, making trails that often lead through shallow water. They usually jump from under old logs, or tangles of briers and underbrush, and go dashing off with a heavy thumping run, but usually with speed enough to escape the dogs. Fires are said sometimes to drive them out of the swamps and marshes by hundreds." They are excellent swimmers, and when chased by dogs will swim back and forth across the creeks. Mr. H. P. Attwater says: "When frightened from their hiding places and chased by dogs they take refuge in hollow trees and in holes in the river bluffs. The dogs seem to have more difficulty in trailing them than they do the Cottontails and Jack Rabbits, the Swamp Rabbits often eluding the hounds by taking to water. I have seen them on several occasions swimming across the river while the dogs were hunting for them on the other side."

The *Marsh Rabbit* makes its home in the lowlands along rivers and the coast of the Southeastern States from Dismal Swamp, Virginia, south to Florida, and west to Mobile Bay, Alabama. It is seldom seen more than 500 feet above sea level. It is slightly larger than the average Cottontail, and runs low on the ground. It readily takes to the water, and if disturbed will plunge into the deepest bogs. Bachman states that it makes for its young a domed nest with an entrance on one side. In Peninsular Florida and the adjacent coast islands and north along the east coast to San Mateo, it is replaced by the *Carolina Swamp Rabbit.* This animal is the smallest, darkest, and most reddish-brown of the Marsh Rabbits and has short, broad, and rounded ears. It has short legs, and is somewhat clumsy, like an overgrown Rat, in appearance. It seldom roams higher than 100 feet above sea level.



Photograph by Dr. R. W. Shufeldt

YOUNG OPOSSUM

A life-size photograph of one of these queer beasts when a few weeks old. At birth they are immature, and are carried in an external pouch for six or eight weeks

ORDER OF POUCHED ANIMALS

(*Marsupialia*)

POUCHED Mammals, also known as Marsupials, are one of the most remarkable and distinctive of all the orders. Most of its members are confined to the Australian region, the Kangaroo being the most familiar type. Only one member, the Opossum, is found in North America.

The order takes its name from the external abdominal pouch of the female, in which the very small young are carried. A number of points in the embryology of the Marsupials, such as the extremely early birth and undeveloped condition of the young, show a wide separation from other orders. The one American family belongs to the *Polyprotodont* section of the Order, so called because of the character of the teeth, which are differentiated into incisors, canines, and molars.

The Opossums are a group that reach their greatest abundance in tropical and South America. The United States is in only the extreme northern portion of their range and thus we have only three sub-species found north of the Rio Grande. There is little liability of confusing this animal with any other North American type. The long prehensile tail, the grasping hind foot, the marsupial pouch, and the number of teeth are sufficiently characteristic to identify the Opossum, being found in no other mammal of the United States.

VIRGINIA OPOSSUM

Didelphis virginiana *Kerr*

General Description.— A good-sized mammal with long gray hair, about the size of a house cat, but with a long, naked tail. Head long and slender; muzzle bare; eyes small; ears large, naked; body rather thick-set; tail prehensile; marsupial pouch present; limbs short; feet with five distinct toes, each provided with nails; first toe of hind foot which is nailless, large and opposed to the others for grasping; soles of feet naked; pelage externally composed of long coarse hairs in color grizzly gray; teeth sharp. An arboreal animal, and the only marsupial found in the United States.

Dental Formula.— Incisors, $\frac{5-5}{4-4}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{3-3}{3-3}$; Molars, $\frac{4-4}{4-4} = 50$.

Pelage.— ADULTS: Sexes identical; seasonal variation slight. Pelage of two coats; underfur short and soft, whitish; upper parts covered with black and white hairs, the latter longer, giving a grayish appearance; head yellowish-white; cheeks pure white; top of head and around eyes blackish; under parts dusky, intermixed with white hairs; legs and feet black; tail black at base, remainder yellowish-white; ears black with yellow spot on upper edge. YOUNG: Quite similar to adults.

Measurements.— Total length, 30 inches; tail vertebrae, 12 inches; hind foot, 3 inches.

Range.— Atlantic Coast from New York to Florida and west to Mississippi and Texas.

Food.— Omnivorous; birds and eggs, mice, frogs, fish, insects and fruit.

RELATED SUBSPECIES

Virginia Opossum.— *Didelphis virginiana virginiana* Kerr. Typical animal of the above description. Great Lakes to the Gulf Coast, and east to Hudson Valley and Florida.

Southern Opossum.— *Didelphis virginiana pigra* Bangs. Smaller and darker; tail longer. Florida, Georgia and Gulf Coast region to western Louisiana.

Texas Opossum.— *Didelphis marsupialis texensis* Allen. Size large; two color phrases, one black, the other gray. Coast region of Texas southward.

Among the North American mammals the Opossum is in a class by itself, inasmuch as it is a marsupial, or pouched animal. The pouch is on the ventral side of the body and serves as a nursery for the young. The young, from six to twelve, are born in a very immature state, blind, helpless, hairless, and very small, weighing from eighteen to twenty-five grains. The mother places the young in the pouch, where they are nourished and kept for about six to eight weeks. After this they venture out and climb over the body of the parent, clinging to her fur. At times the mother arches her tail over her back, as the Squirrel often does, and the little ones cling to it by their prehensile tails, heads down, and the forward feet touching her back, presenting a curious sight indeed! For a few weeks after the young are able to climb out of the pouch they do not venture upon the ground, but return to the pouch for food and protection.

Photograph by E. A. Briggs

TWO HUNGRY OPOSSUMS

These tame Opossums were "snapped" with a small folding pocket camera

The Opossum is nocturnal in its general habits; emerging from its retreat at the close of day, from a hollow tree, a crevice in the rocks, or from under a building, wandering about in search of food. However, I have seen it abroad many times on cloudy days, and occasionally in the bright sunshine. Its menu is varied, but you may be sure it is a full one when it can be procured. Nature has provided the Opossum with teeth and a digestive apparatus indicating its omnivorous character, and an appetite for nearly all kinds of food. In its love for corn it resembles the Raccoon, breaking the stalks in the same manner and feeding upon the tender young kernels. An important part of its food consists of insects of various kinds. The Opossum is very destructive to the ground-nesting birds, destroying eggs and young alike whenever found. If an opportunity comes his way he dines from the poultry yard, and here he shows a decided preference for young chickens. But he should also be given full credit for the mice, moles, and young rabbits that he destroys.

It is in the South, on his native heath, that the Opossum reaches his greatest growth. For him the October sun and the frosts of November mature the juicy persimmon; and from early evening until break of day he lingers at Nature's banquet.

O, heedless Opossum! Could you but see into the future you would not feed thus recklessly upon the fruit, which in a few weeks must render you so temptingly fat! "'Simmon" time brings in "'Possum" time, and from many a cabin the melodious negro voices, accompanied by banjo, are heard singing:

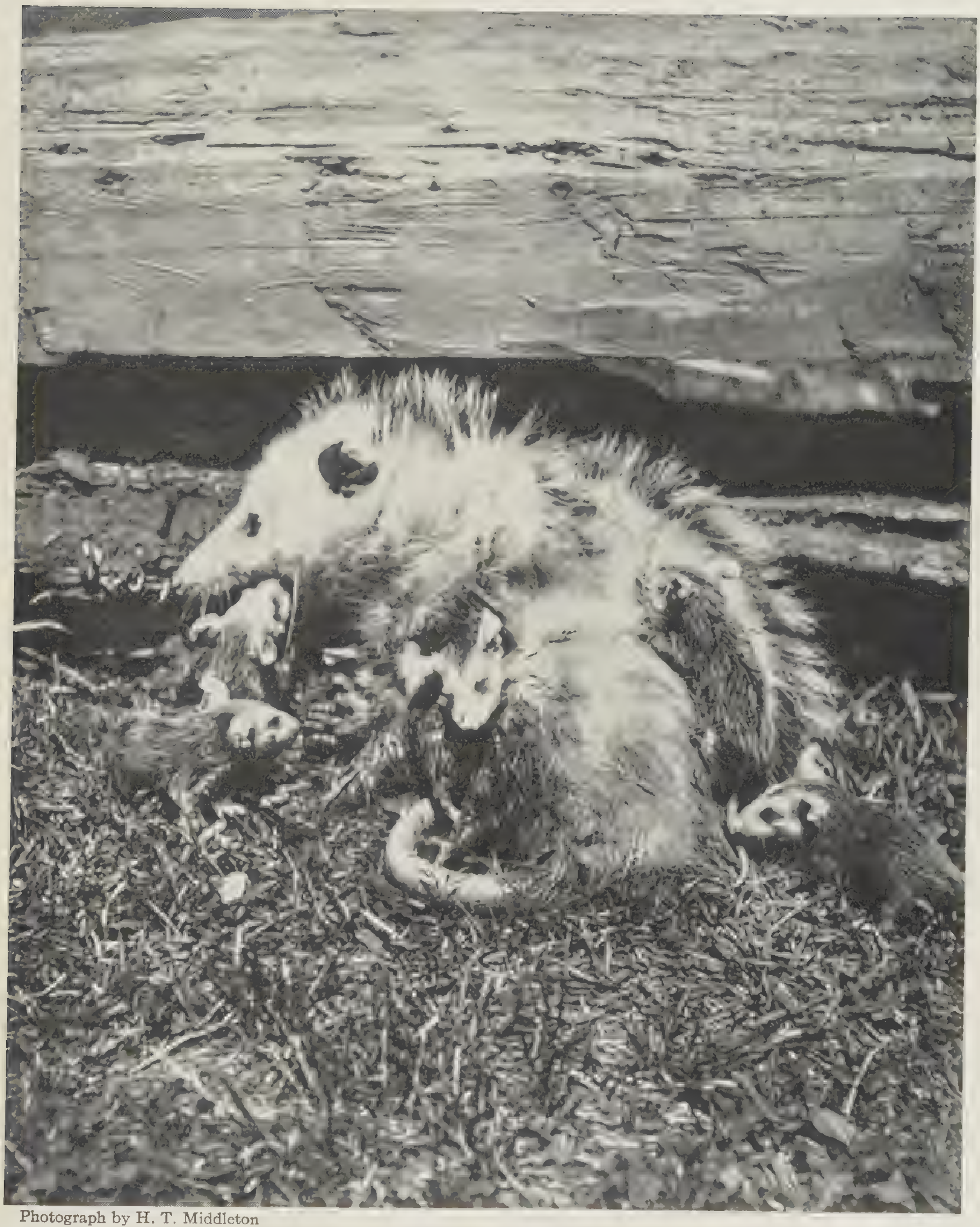
"'Possum am a cunnin' thing,
He rambles in de dark,
Nothin' 'tall disturb his min'
But to hyah my bulldog bark."

The hunting of the Opossum in the South is one of the favorite sports among the colored people, and I will quote from Dr. Bushman:

"'Come, men,' says one, 'be lively, let us finish our task by four o'clock, and after sundown we will have a 'Possum hunt.'

"The paraphernalia belonging to this hunt are neither showy nor expensive. There are no horses, no costly guns imported to order, no pack of hounds answering to the echoing horn; only two or three curs, half hound, half terrier, each having his appropriate name, and each regarded by his owner as the best of the lot. A trail is soon struck, and the dogs all open up at once; in an instant they rush, pell mell, with a loud burst of mingled tongues, upon some animal along the edge of an old field destitute of trees. It proves to be an Opossum, detected in its nightly prowling expedition.

"At first, it feigns death, and rolling itself into a ball lies still on the ground; but the dogs are up to this ''Possum playing' and seize upon it at once. It utters a low growl or two, shows no fight, opens wide its large mouth, and with a few struggles, surrenders itself to its fate But our hunters are not yet satisfied, either with the sport or the meat, so again they hie on the dogs. Another Opossum is soon started, and



Photograph by H. T. Middleton

AN OPOSSUM FAMILY

A mother Opossum and ten young. Four of the little ones are in the pouch it hastens up the first small gum, oak, or persimmon tree within reach, and sits crouching on a limb, with eyes closed to avoid the light.

"'Off jacket, Jim, and shake him down!'

"As the fellow ascends, the animal continues mounting higher to get beyond his reach. Still he continues in pursuit until the Opossum has reached the extreme branches of the tree. The negro now commences shaking the pliant treetop; while the Opossum, with its hind hands rendered convenient and flexible by its opposing thumb, and with its prehensile tail, holds on with great tenacity. But it cannot long resist the rapidly accumulating jerks and shocks. Suddenly the feet slip from the smooth, tiny limb, and it hangs suspended for a few moments only by its tail, in the meantime trying to regain its hold with its hind hands; but another sudden jerk breaks the limb, and down comes the poor animal, doubled up like a ball, into the opened jaws of its eager and relentless canine foes, and yields to fate without a struggle.

ANTICIPATION

A familiar Southern scene, showing the "eternal triangle,"— the 'Possum, the Darkey, and the Dog

"In this manner half a dozen or more Opossums are sometimes captured before midnight."

The Opossum, although a very stupid animal, has one very clever trick. When attacked it simulates death most successfully. At such times the eyes are closed, the muscles are rigid, the breath suppressed, and no amount of rough handling will provoke any signs of life. The position assumed when "playing 'possum" is that which the animal usually takes when sleeping; the body is curled up, the head between the fore legs, the nose touching the stomach, and, upon the whole, it is the position best calculated to prevent injury from blows upon the head or breast. This art has probably saved many Opossums from destruction by other animals. Opossums that are partly tamed seem never to practice this peculiar trick. The present writer has found that the most effectual method of reviving the seemingly lifeless animal is to drop it into a pool of water. The immersion usually ends the "playing 'Possum" at once, and the animal speedily seeks the shore.

It is only just to say that there is a belief among many naturalists that the Opossum never "plays 'Possum," in an attempt to deceive. Says one: "Does the Opossum ever deliberately make the effort to deceive its captors by assuming such a position as to appear dead? If such be the case, it will be well to look beyond the mere fact of thus feigning death, and see what such an act, if voluntary, really indicates.

"First, the real object is to render itself useless or unattractive to its captors. Now, what is there in Opossum life that could give rise to such an inspiration? Could the experience of past generations, exposed as they were to the enemies characteristic of the different environment, do so?

"Then, in the second place, the assertion that the Opossum feigns death necessarily assumes that the animal in question realizes what death is. If so, then in fancying that we see death feigned on the part of the Opossum, we ascribe to it a process of reasoning which is fallacious, as the knowledge of death and its certainty is confined to man.

"Since this is the habit of the Opossum, it must necessarily have originated long prior to the advent of man upon the earth, and been acquired as a safeguard against the attacks of enemies not now existing, which would not molest it if they supposed it to be dead. It is a habit that militates against its safety, and could never have been acquired in its present environment. Speed, if exercised, would in many cases insure safety, and the Opossum can run when it chooses to make the effort.

" Whatever the origin of the habit, if such it is, it cannot be logically regarded as voluntary. The brain of the Opossum is too primitive to have evolved this degree of cunning, forethought and contrivance."

In order to test the supposed habit, I have sought them out in their hiding places and endeavored to make them " show off." In one case an Opossum was captured in a box trap. On lifting the lid of the trap, the animal was found to be curled up into a form as nearly globular as possible. Being disturbed, it slowly raised its head, opened its mouth, but did not offer to bite, and in this position it quietly awaited coming events. After some five minutes of mutual staring, the Opossum closed its mouth and slowly restored its head to a more easy position, and even closed one eye, as though the other was all that was necessary to note what might occur. On being roughly handled and given several pushes with a stick, it again opened wide its mouth and protested against the disturbance by a low, hissing sound, but did not uncoil its body.

If the animal at that time realized that it was a prisoner, it certainly did not fear death, for it made no effort to escape, which fear of death would cause it to do, since it was in no way disabled. After waiting an hour, and seeing no signs of feigning unconsciousness, but, instead of it, a most provoking indifference, I walked off some distance to a point where I could see the trap, but was myself hidden from the Opossum. Fully ten minutes elapsed before I saw any movement on the part of the animal, and then it was a very gradual uncoiling of the body, a protracted yawn, a stretching of the limbs, and then, standing up, he looked about and very deliberately walked off. I ran toward him, seizing him by the tail, whereupon he recoiled his body and spread his jaws to the utmost. When I threatened violent blows about his head, it slowly sank, and the eyes closed, but this was not a feigned act. The breathing was affected, the surface temperature of the body was lowered, and I believe it was a true faint. Furthermore, as in fainting, the application of cold water had the effect of restoring the animal to consciousness. I have made scores of experiments of this kind, when the *fainting through fear* was more sudden, and in no experiments have I seen anything to suggest intentional feigning of death.

REALIZATION

Baked 'Possum and Sweet Potato are the joy of the Southern darky

Another observer, in speaking of the Opossums in the Southern States " being attacked by turkey buzzards, and going into ' spasms,' during which the buzzards injured the eyes of the Opossums and otherwise wounded them," says, " this being the ordinary result of a ' make-believe,' would even as foolish a creature as the Opossum long continue it?" S. A. Lottridge.

ORDER OF TOOTHLESS ANIMALS

(*Edentata*)

THE name *Edentata*, meaning toothless, is not very appropriate for this large and widely differing order, since many members possess teeth. The name however, is correct to the extent that many of the teeth usually found in other mammals are missing in Edentates. The order is quite well-distributed throughout the world but has probably most representatives today in South America. Only one species of this order, the Armadillo, reaches the United States. The many strange types included in the order often have but few characters that serve to make them related. The best resemblances are seen in the teeth which are always either absent or very poorly developed, generally all of one type, never rooted, but with persistent pulps and usually deficient in enamel. Other families include the Sloths and Ant-eaters.

The Armadillo family comprises small to medium-sized Edentates having the greater part of the skin so strongly ossified as to resemble plates of armor, whence the name. Members of this family have teeth numerous, simple, and of persistent growth; skull with zygomatic arches complete; forefeet adapted for digging and scratching, with strongly developed curved claws, three to five in number; and hind feet plantigrade, with five toes all provided with nails.

TEXAS NINE-BANDED ARMADILLO

Dasypus novemcinctus texanus (*Bailey*)

General Description.—A peculiar-looking mammal with bony shell somewhat like a turtle. Head triangular in shape and covered with bony plates from between the ears almost to end of snout; ears large, naked; tail inclosed in twelve rings; covering of underparts not strongly ossified; limbs short; claws long; fore feet with four visible toes; hind feet with five toes. A burrowing mammal.

Dental Formula.— Incisors, $\frac{0-0}{0-0}$; Canines, $\frac{0-0}{0-0}$; Premolars, $\frac{0-0}{0-0}$; Molars, $\frac{8-8}{8-8}$ or $\frac{7-7}{7-7}=32$ or 28.

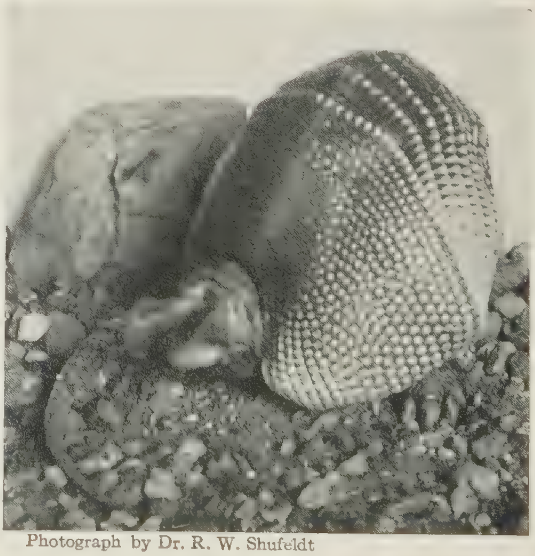
Pelage.— ADULTS: Sexes identical, no seasonal variation. Almost hairless, a few scattered hairs to be found on head and under parts; shield on head pale brown; carapace or bony shield black with scutes on sides yellowish-white; tail brownish-black with anterior half of scutes yellowish-white; ears brown; toes yellowish; claws white; skin of head flesh color with a few yellowish hairs.

Measurements.— Total length, 32 inches; tail vertebrae, 14.8 inches; hind foot, 4 inches; carapace, 13 inches by 16 inches.

Range.— Texas south into Mexico.

Food.— Insects; mainly ants.

Remarks.— This Armadillo is not known to range farther north than southern Texas. To the southward, however, its range extends throughout South America. There is little likelihood of this animal with its peculiar bony carapace becoming confused with any other mammal. Only the one species comes under our consideration.



Photograph by Dr. R. W. Shufeldt

"PREPAREDNESS"

Nine-banded Armadillo rolling itself up into a ball, for protection

The Nine-banded Armadillo, an occasional visitor across our Southern border, is one of the curious survivors of a prehistoric family.

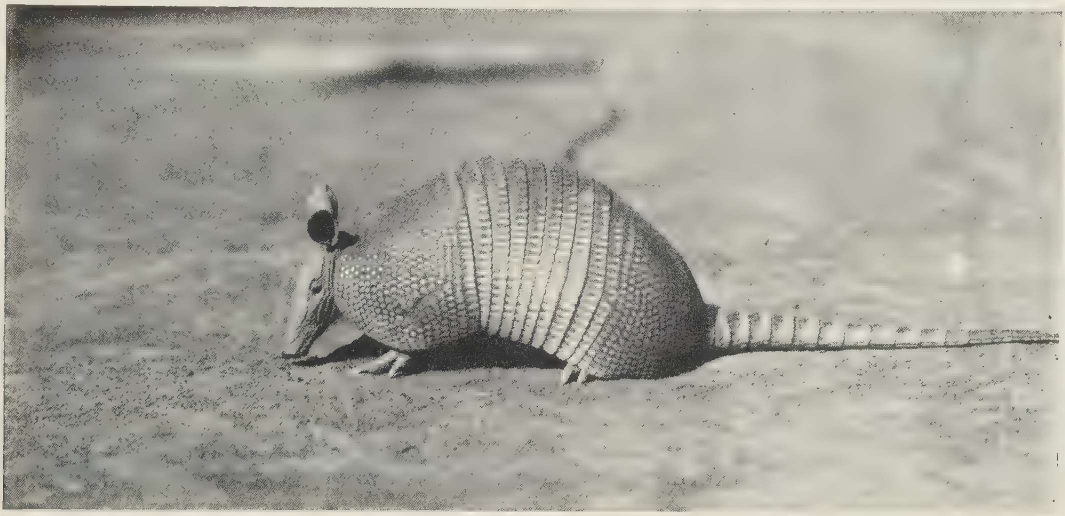
Ages ago, across the pampas of South America roamed a group of lumbering animals protected by huge dome-like shells. Some were provided with long tails studded with protective knobs like the armor of a knight. These prehistoric Armadillos were called Glyptodons, and their strong defensive armor protected them for a long time against their enemies.

The early Armadillos reached their largest size in Argentina. Thence they ranged northward, gradually dwindling both in size and numbers until today, in each respect, they are comparatively insignificant. Three species still are fairly common. These are known, from the leaves on their armor, as the "Three-banded," the "Six-banded," and the "Nine-banded" Armadillos. A fourth species, the Giant Armadillo, is practically extinct.

The Nine-banded Armadillo, our most northerly visitor, ranges north from Paraguay through tropical America to Mexico, and occasionally crosses the Rio Grande into Texas. It is an extensive range, and much larger than that of other species. The body is protected by a bony shell consisting of large sections joined in the middle by nine bony rings, which hinge into each other so neatly that the animal can literally roll itself up into an armor-encased ball. At the first hint of danger, up it rolls — even the top of its head being armored — thus presenting a tough nut for even the strongest animal to crack.

The Armadillo likewise finds both a shelter and a home by digging in the earth, its toes being armed with exceedingly long claws which penetrate rapidly into the hardest soil. These are practically all its means of defense, since while it can run rapidly, its legs are so short that it cannot go far. It cannot climb trees; and its lack of front teeth is a further weakness.

The Armadillo roams chiefly by night. It prefers the open country and is found on the most arid wastes. In movement it is quick, nervous, and furtive. It does not show any high marks of intelligence, but its chief propensity is to burrow. "In Venezuela," says Dr. Hornaday, "I found it burrowing on the open savannas, going down about four feet, in a hole seven inches in diameter. The flesh of this creature is well-flavored, and is generally esteemed as palatable food. Being in a state of perpetual hunger, we found Armadillo stew very much to our taste. In captivity its food is milk, boiled eggs, and chopped meat, but in a wild state it feeds upon a mixed diet of worms, ants, snails, beetles, small lizards, grasshoppers, and other insects. The young in a litter vary from six to ten."



ARMADILLO

The wonderful defensive armor of this strange beast is clearly shown from this life picture, taken near the Mexican border

ORDER OF INSECT-EATING ANIMALS

(*Insectivora*)

THE order *Insectivora* includes the small insect-eating mammals, the most familiar being the Mole and the Shrew. This order is a large one with many families which often do not bear very much resemblance to one another. In North America only two families are found, the *Talpidæ* or Moles, and the *Soricidæ* or Shrews. The North American Insectivores, and to a greater or less extent the other members of the order, present the following characters. The snout is long and projects beyond the lower jaw; the feet have five toes, provided with claws, and the animal is plantigrade or sub-plantigrade; the body is covered with soft fur; the teeth are numerous and the cusps sharp and prominent, but the differentiation into incisors, canines and molars is not carried out so far as in higher orders; clavicles are present; musk glands are present; and the animals are almost strictly insect and animal feeders. In both the North American families the eyes are exceedingly small and the ears are minute or rudimentary.

THE MOLE FAMILY

(*Talpidæ*)

MOLES furnish one of the strangest and most interesting marvels of Nature's handiwork. Here is a group of mammals destined from birth to life-long blindness; spending their whole lives in subterranean darkness; digging, digging, digging, in order to obtain the food necessary for their subsistence; rendering to the farmer a service that is simply inestimable in its value, yet regarded as animals worthy only of complete extermination. When of a morning we look upon the little ridges of new-turned soil disfiguring our lawns, we instinctively say " Those wretched moles again! " forgetting that the little shovellers have simply been working where they best could find their food. It is true that sometimes the tunnels dug by moles admit of the incursions of rodents which injure tubers, roots, and planted seeds; but it has yet to be proved that the harm done by Moles is not more than offset by their destruction of cutworms, wireworms, and other noxious pests of the husbandman.

So highly specialized are the Moles for a burrowing life that they possess structures found in no other mammals and consequently are quite easily identified. The very large fore feet, minute eyes and ears, short, thick tail, and velvety fur are strictly Mole characteristics.

The Moles of America are now classified by naturalists in five genera. Mr. Hartley H. T. Jackson, of the U. S. Bureau of Biological Survey, in " A Review of the American Moles " says: " Moles occur rather generally in eastern North America along the Atlantic and Gulf coasts from Labrador to Florida, and in northeastern Tamaulipas, Mexico, and range westward to Manitoba and northeastern Colorado. Within this area are found three genera, *Scalopus*, *Parascalops*, and *Condylura*. West of this area no Moles are found until the Pacific coast region is reached. There, two other genera, *Scapanus* and *Neurotrichus*, occur, their ranges being confined mainly to the humid and semi-humid region west of the Cascade Range, and the Sierra Nevada, from southern British Columbia to northern Lower California."

COMMON MOLE

Scalopus aquaticus (*Linnaeus*)

Other Names.— Eastern Mole, Naked-tailed Mole.

General Description.— A thick-set burrowing mammal with large and broad fore feet. Head narrow and pointed; muzzle naked and hog-like; no noticeable external ear; eyes minute and not visible externally; teeth numerous and sharp; neck very short; tail short and thick, nearly naked; limbs short; pelage soft and velvety. Strictly subterranean in habit.

Dental Formula.— Incisors, $\frac{3-3}{3-3}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{3-3}{3-3}$; Molars, $\frac{3-3}{3-3}=40$.

Pelage.— Adults: Sexes identical, no noticeable seasonal variation. A uniform lead color tinged with brown, in some lights appearing dark, in others silvery-gray; under parts like upper part; feet and tail white. Molt twice a year, in spring and fall. Young: Closely resembling adults.

Measurements.— Total length, 6 inches; tail vertebrae, 1 inch; hind foot, .8 inch.

Range.— Eastern United States south to Florida, westward to Mississippi.

Food.— Insects, largely beetles, and angle-worms.

Remarks.— Marked differences are noted in various species. The group to which the Eastern Mole belongs, *Scalopus,* with seven species and subspecies, is quite closely related to the Western Mole group, *Scapanus,* with eight species and subspecies, the latter differing mainly in cranial characters such as the possession of four more teeth. In separate groups we have the Star-nosed Mole, Brewer's Mole, and the Shrew Mole further described below.

Related Species

Common, or Eastern Mole.— *Scalopus aquaticus aquaticus* (Linnaeus). Typical animal of the above description. Eastern United States south to Florida, westward to Mississippi..

Prairie Mole.— *Scalopus aquaticus machrinus* (Rafinesque). Size large, slaty-brown. Mississippi Valley northward to Wisconsin and Minnesota, southward to Tennessee and Missouri, westward to Kansas, Nebraska and South Dakota.

Texas Mole.— *Scalopus aquaticus texanus* (Allen). Size small; pale chestnut-brown. Coast of Texas.

Copper-colored Mole.— *Scalopus aquaticus aereus* (Bangs). Larger than Texan Mole; color rich coppery-chestnut. Oklahoma.

Western Mole, or Townsend Mole.— *Scapanus townsendii* (Bachman). Largest of the Moles; blackish with purplish reflections. Coast range to Cascade Mountains of Washington and Oregon.

California Mole.— *Scapanus latimanus latimanus* (Bachman). Size moderate; grayish-brown. All California west of the Coast range, north to Oregon.

Anthony's Mole.— *Scapanus anthonyi* (Allen). Smallest of the true Moles; coloration silvery-gray. Southern California into lower California.

Star-nosed Mole.— *Condylura cristata* (Linnaeus). See special synopsis.

Brewer's Mole, or Hairy-tailed Mole.— *Parascalops breweri* (Bachman). See special synopsis.

Shrew Mole.— *Neurotrichus gibbsii gibbsii* (Baird). See special synopsis.

It has been aptly remarked that there is no common animal less common that the Common Mole. The disfiguring results of its labors are prominent on the lawns and in the fields; but the animal itself is seldom seen, and its habits are comparatively little known. It is most plentiful in meadows, gardens, and similar habitats, but is by no means confined to them, and frequently is found in open woodland, along the banks of streams, and in other environments.

The little mounds and ridges of upturned earth seen on our lawns are not true molehills, but merely the soil thrown up to the surface by Moles in digging their tunnels. Few persons have any idea of the rapidity with which these passages are excavated. The Mole's fore paws are about three-quarters of an inch wide and the palms are turned outward. Mr. Edward T. Martin, who has watched the animal at work, says: "In throwing dirt behind, it uses a motion like a boy in swimming, bringing the hands forward until they touch in front of the nose, then thrusting them outward and backward to push the soil aside, the body following in the passageway thus made."

The quickness with which a Mole works and the distance that it can tunnel in a given time are almost incredible. In a single night a Mole has been known to tunnel more than seventy-five yards; Dr. Merriam traced a fresh tunnel nearly a hundred yards; and Dr. Hornaday, observing the work of a Mole he had placed in a clover field at eleven o'clock in the morning, found that during the first seven hours it had tunneled twenty-three feet, in a zig-zag line. During the next seventeen hours thirty-five feet, and during the next hour ten feet more. The total work consisted of sixty-eight feet of main line and thirty-six and a half feet of branches, making in all one hundred and four and a half feet.

Proportionately to the animal's body, the arm and forearm are of enormous size; and, as has been seen, tremendously powerful. Sometimes the tunnels are but five or six inches below the surface; but they have been found at a depth of four feet or more, undoubtedly the result of the Mole pursuing worms and insects into moister regions. The Common Mole seldom leaves its tunnels, of which there are two lines, one above the other. Mr. Jackson thinks the upper tunnel may be used but once, during the animal's hunt for food, but that the main one may be used for a considerable time.

In the northern half of its range, the young of the Common Mole are born hairless, in March or April; in the southern half, later. There is probably only one litter annually, and this varies from two to five, the usual number being four. The nest is about five or six inches in diameter and usually twelve to eighteen inches below the surface. Most frequently it is placed under roots of shrubs or pasture grass and is made of grass and rootlets, but occasionally partly of leaves.

The fur, which is molted twice a year, is soft and velvet-like. It is in considerable demand for trimmings and garments. In 1913 there were 1,455,124 moleskins sold at the London auctions. These were largely from the European Mole; but the American skins are equally good, and, when from the colder districts, possibly better.

The fur is always very clean, which is to be wondered at when we think of how much of his time is spent in forcing his way through the earth. The fact that he is not soiled by contact with the earth is explained when we examine his fur. Instead of the hairs being large at the bottom and tapering toward the outer end, or of even thickness throughout, as in other animals, they are small where they leave the skin and increase toward the center, growing smaller again at the outer ends. This is the reason his fur is not ruffled by being rubbed in any direction, and explains why it does not take up the earth as readily as the hair of other animals does. But there is still another reason why "dust does not stick to him." Under the Mole's skin there is a muscle-membrane, and from time to time he moves this muscle violently so as to shake the earth from his fur.

Moles are very quarrelsome and frequently fight when they meet. A graphic account of

Photograph from the West Va. University Experiment Station

COMMON MOLE

Though one of our commonest animals, little is generally known about this mysterious prowler — one of the most voracious of all living things

one of their battles, is given by a passer-by who happened to witness it: "Walking along a quiet lane, I heard some very funny little squeaks proceeding from the other side of the hedge. I am perfectly used to all sorts of animal and bird sounds, but had never heard the like of these before. On getting cautiously over the hedge, I found two Moles fighting in the ditch. I went to within two yards of them, but they took not the slightest notice of me, so intent were both on their business. I at once looked at my watch. They kept on, up and down, scratch and bite, for seven minutes, when one turned the other completely over on his back, and seized him by the throat, which he cut as cleanly as if done by a knife, thus finishing the fight. The way in which they used their formidable front feet was surprising."

The Mole is one of the most voracious of all animals. If it were the size of a Lion or Tiger it would be by far the most terrible creature that we could imagine, for its fierceness is proverbial. Its insatiable appetite constantly demands food. Mr. L. E. Adams says: "The accounts of the short periods of starvation necessary to kill a Mole are borne out by my observations. On one occasion I caught a vigorous Mole, quite unhurt, and fed him at intervals during the day with about a third of a pint of worms, besides which he had several drinks of water. At night, about eight o'clock, I dug about a third of a pint of worms, and put them into his den (a packing case with earth at the bottom) and left him. In the morning I found him very feeble, thin and cold. I took him up in my hand and put his nose to some water, which he seemed to enjoy, but he was too feeble to tackle a worm, and presently, after a gentle convulsion, he died in my hand. I found on dissecting him that the stomach was absolutely empty, in spite of the fact that he had eaten every worm left for him."

That the Mole is a friend of the farmer is shown by a test made by Mr. Fred E. Brooks of the West Virginia University Agricultural Experiment Station: "I kept one large Mole in a box half filled with earth for thirty-three days. It was fed daily on earthworms, insects, and flesh of other kinds, of which it ate a surprising quantity. Several potatoes were kept in the box during most of the period, but the Mole did not once sample them. In the space of twenty-four hours, this Mole ate fifty large white grubs, one "chestnut worm," one wire worm, one cicada nymph, forty-five larvae of "rose bugs," and thirteen earthworms. The insects weighed forty-two grams and the earthworms twenty-four grams, making a total of sixty-six grams. The Mole itself weighed fifty grams, or about four-fifths as much as the food taken. It should be mentioned here that it was the custom of this Mole in eating earthworms to take one end of the worm in its mouth and then draw the body between its claws in such a way as to force out all the earthy matter from the digestive organs. The weight, therefore, given for the earthworms, is likely a little too great, as this discarded portion would have weighed a few grams. However, after deducting it from the quantity given, that remaining would still weigh more than the Mole itself. The Mole had been well supplied with food up to the time the test began, and I believe that the figures represent a fair daily average of the food consumed. If correct, a single Mole would eat in the course of a year something like 40,000 insects and worms, which would weigh over fifty pounds.

"Two days later I caught a Mole and confined it in a box similar to the one in which the Mole just described was kept. The Mole was caught by hand and was not injured in any way. Water, but no food except potatoes, was given it. Early on the following morning it died of starvation. One of the potatoes was found to be slightly scratched as by the Mole's teeth or claws, but, if any had been eaten, the amount was very small. No trace of potato was found in the stomach. Later, another Mole in captivity died in a similar manner when given nothing but potatoes."

The results of these experiments agree with what economic zoologists long ago found out, that the accusations made against Moles of eating potatoes and other vegetables in the field, are almost, or entirely, groundless. They also agree with the account given by Adams, showing the inability of Moles to undergo more than a very brief period of starvation.

This strange little beast seems adapted by nature to the simplest and most mechanical of functions. Its senses are rudimentary, that of sight being almost entirely lacking. Its eyeball is only about the size of a pinhead, and probably all it can distinguish is strong light from darkness. The changing seasons and all the bright busy world above it pass unheeded, in its blind patient search for food, and still more food.

The *Western*, or *Townsend's Mole* is the largest of the genus *Scapanus*, being over eight and three-quarters inches in length. In its winter pelage its upper parts are blackish-brown to almost black, usually with a purplish sheen; the under parts are slightly paler. In summer, the purplish sheen is more pronounced. Its habits do not differ widely from those of the Common Mole, except in regard to breeding, the young being usually born in May or June. The number of young ones is two or three, seldom four, and not infrequently only one. Like all the species and subspecies of this genus, of which there are eleven, Townsend's Mole is found in the Pacific coast region, its range extending over the extreme northwest of California, Oregon, and that part of Washington west of the Cascade Mountains.

STAR-NOSED MOLE

Condylura cristata (*Linnaeus*)

General Description.— Similar to Eastern Mole, but nostrils with a curious, fleshy, star-shaped pad formed by twenty-two cutaneous processes. Feet scaly; tail three-quarters as long as body, covered with scattered hairs, constricted at base; fore feet broad.

Dental Formula.— Incisors, $\frac{3-3}{3-3}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{4-4}{4-4}$; Molars, $\frac{3-3}{3-3} = 44$.

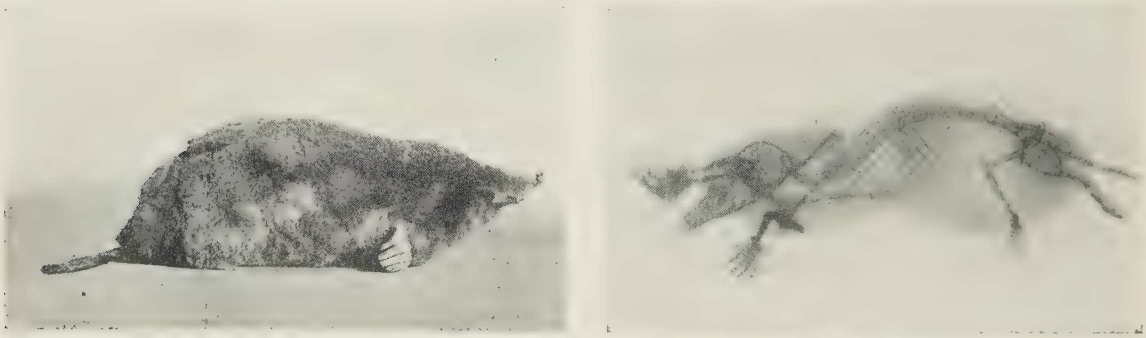
Pelage.— ADULTS: Sexes identical; seasonal variation slight. Above dusky brown or blackish; below paler and grayer on sides of throat and chin; tail more or less covered with blackish hairs; feet dusky. In winter the tail is enlarged. YOUNG: Similar to adults.

Measurements.— Total length about 7 inches; tail vertebrae, 2.7 inches; hind foot with claw, 1 inch.

Range.— Eastern North America north to 51°, from Manitoba to the Atlantic, and south to Illinois, Virginia, and in the Allegheny Mountains to the boundary of South Carolina.

Food.— Insects and worms.

Remarks.— Although closely related to the Eastern Mole, the Star-nosed Mole is characterized by significant features such as its star nose and different dentition, and is therefore placed in a genus by itself. There is only the one species known of this peculiarly marked animal.



TWO VIEWS OF THE MOLE

The interior view, showing the peculiar curving form of the skeleton, was revealed by the Roentgen rays

This Mole, which is the only representative of the genus *Condylura,* is notable for its remarkable nose, which terminates in a naked disk surrounded on its margin by a fringe of twenty-two feelers symmetrically arranged, eleven on each side of a median line. It is found in southeastern Canada from southern Labrador to Manitoba, and as far south as South Carolina.

Though occasionally occupying the same tunnels as the Common Mole, this species prefers to make its home in wet meadows and marshes. The ridges of earth made by it are more irregular than those of the Common Mole, more crooked, and smaller. Unlike its cousins it frequently leaves its tunnels in winter, and burrows in the snow, even running on top of it.

Little is known about the breeding and nesting habits of this Mole. There is in the Biological Survey collection a family of five young about one-third grown, which, according to Jackson was found in a nest under a log on the flats of the Potomac river a short distance north of Georgetown. Bishop, writing of some young that were probably ten days old, said, "the fur was just beginning to start, which gave the skin a dark-brown color."

Mr. Francis H. Allen contributes to *Science* some interesting information concerning a Star-nosed Mole that he caught entering a half-rotten willow stump, at the edge of a little pond in the woods at West Roxbury, Mass., and placed in a cage at his home. He writes: "I dug some earthworms and placed them one by one in the cage. Apparently the Mole's power of scent is nearly as weak as its eyesight, for it paid no attention to the worms unless they were dropped directly in the path it pursued about the edge of the cage. When it actually ran its nose into one, it ate it with astonishing greediness and in a curiously piggish way, with a constant shaking of the head, and shuffling the worm into its mouth with the help of its hands, which it moved in unison. It devoured ten worms before its appetite began to flag. One very large one it abandoned after cutting it into three pieces by bites. I heard no noise of teeth, as described by Audubon. A saucer of water was not noticed for some time; finally it put its nose into it and drank with the same motion of the head. It then tipped up the saucer, spilled the water, and then seemed to drink it off the board in a way that reminded one of sponging out the bottom of a boat. It continued the same operation on the dry part of the board, as if it could not tell where the water ended, except by feeling." There was nothing nervous about the actions of this Mole, and Mr. Allen estimated that the creature's intelligence did not rise much above "life, liberty, and the pursuit of earthworms."

Hawks and owls are among the enemies of the Star-nosed Mole, but they must be on the alert, in order to surprise it above ground.

BREWER'S MOLE

Parascalops breweri (*Bachman*)

Other Name.— Hairy-tailed Mole.

General Description.— A large Mole, with thick, short and densely-haired tail; nostrils simple and crescent-shaped; eyes and ears small; limbs short; fore paws powerful.

Dental Formula.— Same as Eastern Mole.

Pelage.— General tone fuscous-black, slightly paler and more grayish on under parts; hairs on feet, and usually on nose and tail, more brownish, often becoming white in old adults; throats and underparts sometimes stained with Dresden brown.

Measurements.— Total length, 7 inches; tail vertebrae, 1.2 inches; hind foot, .8 inches.

Range.— From mountains of North Carolina, West Virginia, and southeastern Ohio, northeastward through Pennsylvania, New Jersey and New York, to New Brunswick.

Food.— Insects and worms.

Remarks.— Brewer's Mole is the only representative of the genus *Parascalops*. The peculiar marks of this genus are noted above. It is seldom found in the haunts of the Common Mole.

Brewer's Mole deserves special attention from the fact that, like the Star-nosed and the Shrew Moles, it has certain distinguishing marks which place it in a class by itself. In habits, however, it differs little if any from its cousins.

It is found from southern New Brunswick to the Appalachian Mountains, and as far south as North Carolina. Curiously enough, although dwelling in the immediate range of the Common Mole, the two are seldom found together.

Brewer's Mole, often called the Hairy-tailed Mole, is a little under seven inches in length; its nostrils are crescentic, with concavity upward; the tail is short, thick, and densely covered with hair. This Mole is very difficult to trap, and little is known concerning its breeding habits and times of molting. Its general habits, as stated above, are believed to be much the same as those of the Common Mole. It subsists upon worms, grubs and other insect food.

SHREW MOLE

Neurotrichus gibbsii (*Baird*)

General Description.— A very small Mole lacking the wide fore feet. Head small; snout elongate; eyes and ears minute; body only moderately thick-set; tail fairly long, thick and hairy; limbs short; fore feet somewhat expanded and larger than hind feet; claws long, acute, compressed; upper and under surface of all feet covered with small plates; nostrils simple, naked; pelage soft but not so velvety as in the larger Moles.

Dental Formula.— Incisors, $\frac{2-2}{1-1}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{3-3}{4-4}$; Molars, $\frac{3-3}{3-3}=36$.

Pelage.— Adults: Sexes identical; seasonal variation not conspicuous. Dark sooty-brown above, very little lighter below; some of the hairs more lustrous than others giving a hoary appearance. YOUNG: Similar to adults.

Measurements.— Total length, 5.5 inches; tail vertebrae, 1.5 inches; hind foot, .7 inch.

Range.— Fraser River, British Columbia, west to Cascade and Sierra Nevada Mountains, south to Shasta County, California.

Food.— Insects and worms.

Remarks.— The Shrew Mole appears to be a connecting form between the Shrews and the Moles but is rather more mole-like and is consequently placed in the Mole family. That it has not reached such a high degree of specialization as the large Moles is at once apparent from an examination of the fore feet. There are three subspecies.

RELATED SUBSPECIES

Shrew Mole.— *Neurotrichus gibbsii gibbsii* (Baird). Typical animal as described above. Pacific Coast of North America from Fraser River, British Columbia, to northern California.

Big Shrew Mole.— *Neurotrichus gibbsii major* Merriam. Larger, tail longer, feet larger, underparts darker. Mount Shasta region, California.

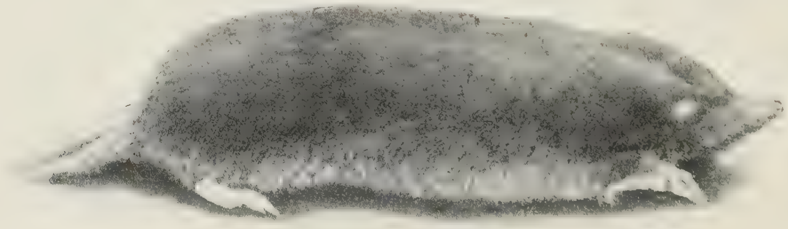
Hyacinthine Shrew Mole.— *Neurotrichus gibbsii hyacinthinus* Bangs. Larger than the Shrew Mole; black with green and purple reflections. Marin County, California.

This is the smallest of all American Moles. The snout terminates in a naked disk or pad; the ear opening is large; and the tail is long and thick, and sparsely covered with coarse hairs. The fore feet are not so handlike as those of the other Moles, and the toes are not webbed. It is, in fact, a connecting link between the Moles and the Shrews, as its name indicates. It occupies a separate genus, called *Neurotrichus*.

This little animal is found in the extreme southwestern part of British Columbia, western Washington, and Oregon west of the Cascade Mountains, south in the coast region to Eureka, California, and also in the interior.

According to Jackson, "the little *Neurotrichus* prefers a damp habitat and is seldom found far from swamps, marshes, or streams. In the extreme southern part of its range it is most frequently found in swampy places overgrown with sedges or shrubs. Farther north its habitat is less confined and it is found along streams or even in moist dense woods."

The tunnels of the Shrew Mole resemble those of the Star-nosed Mole more than those of others, and it spends a great deal of its time under logs or in surface runways. Its tunnels are very like those of the eastern Pine Mouse, being often open above for some distance.



Photograph from the West Va. University Experiment Station.

BREWER'S MOLE

About two-thirds natural size. This animal does not eat potatoes or other vegetables, but feeds extensively on earthworms and white grubs

THE SHREW FAMILY

(*Soricidæ*)

SHREWS constitute the largest family of the Insectivores, and include the smallest of all mammals. These tiny animals, some of them but little more than three inches long, are sometimes mistaken for Moles and, more often, as they scuttle through the grass or fallen leaves, for Mice. In the gardens and in the woods, in the dry fields and in swamps and marshes, on the plains and in high mountains, a Shrew of some sort is usually to be found.

Many of the Shrews are hardy little creatures, and some of the northern species may be seen abroad even in the cold of an Arctic winter. Although they are classed among the insect-eating mammals, insects are not their only food. Dr. D. G. Elliot says: "They do not confine themselves by any means to an insectivorous diet, but devour worms, small birds or any scraps of meat that fall in their way."

The Shrews are characterized as very small Insectivores with mouse-like forms and long slender snouts. They have well-furred bodies and well-developed tails usually covered with short hairs. The eyes and ears are small; the feet are slender or only slightly widened; the skull has no zygomata. Most of the Shrews are terrestrial, but a few are aquatic. This family contains more than half the representatives of the order.

For present purposes, the Shrews of America may conveniently be divided into four groups, namely: Long-tailed Shrews (genus *Sorex*); Small Shrews (*Microsorex*); Short-tailed Shrews (*Blarina* and *Notiosorex*); and Swimming Shrews (*Neosorex* and *Atophyrax*).

COMMON SHREW

Sorex personatus *I. Geoffroy*

Other Names.— Long-tailed Shrew, Cooper's Shrew, Masked Shrew, Shrew Mouse.

General Description.— A very small mammal with a sharp nose, minute eyes, and fairly long tail. Ears small and nearly hidden by hair of head; teeth sharp and stained with chestnut at the tips; body slender; legs short and slender; pelage thick and soft. An active, quick-moving little animal.

Dental Formula.— Incisors, $\frac{4-4}{2-2}$; Canines, $\frac{1-1}{0-0}$; Premolars, $\frac{2-2}{1-1}$; Molars, $\frac{3-3}{3-3}=32$.

Pelage.— Adults: Sexes identical; seasonal variation slight. Above, sepia-brown and occasionally chestnut; below, ashy-gray or brownish-ash; tail above blackish, below whitish. Young: Like adults.

Measurements.— Total length, 4 inches; tail vertebrae, 1.5 inches; hind foot, .5 inch. Weight, 2.85 grammes, or 43.95 grains.

Range.— North America from New England to Alaska, except the southern Rocky Mountains and Cascade Sierra systems; south in Alleghenies to Tennessee and North Carolina.

Food.— Insects, and any animal food it can secure.

Remarks.— Six genera go to make up this group, for specialization along several main lines has taken place. The genus *Sorex* with 42 species and subspecies is easily the largest group, and most of its members vary superficially only in color and somewhat in size. The related genera vary more widely in proportions of parts and in special adaptations to be discussed in the synopsis of these forms. There are 66 species and subspecies in all.

Related Species

Common Shrew.— *Sorex personatus personatus* I. Geoffroy. Typical animal as described above. North America from New England to Alaska, south to Tennessee and North Carolina in the Alleghenies, but not found in the southern Rocky Mountains and the Cascade-Sierra systems.

Richardson's Shrew.— *Sorex richardsonii* Bachman. Larger, back very dark brown, sides fulvous-brown, under parts ashy-plumbeous. Plains of Saskatchewan, and in Minnesota and Wisconsin.

Arctic Shrew.— *Sorex sphagnicola* Coues. Size medium; above, dark seal-brown, grayish-brown below.

Extreme northern British Columbia to Hudson Bay.

Wandering Shrew.— *Sorex vagrans vagrans* Baird. Size small; tail as long as head and body; dark brown or russet on upper parts. Southern British Columbia, western Washington, Oregon and northern California.

Dusky Shrew.— *Sorex obscurus obscurus* Merriam. Larger than Wandering Shrew or Common Shrew; sepia-brown above. British Columbia and mountains of Washington, Idaho, Montana, Wyoming, Utah and Colorado south into California.

Trowbridge's Shrew.— *Sorex trowbridgii* Baird. Size large; sooty brown or black. Western Washington and Oregon.

California Shrew.— *Sorex californicus californicus* Merriam. Size small; above, dark ash-gray and blackish. Central California.

Fisher's Shrew.— *Sorex fisheri* Merriam. Size large; dull chestnut-brown above. Virginia and North Carolina.

Pacific Shrew.— *Sorex pacificus* Coues. Largest Shrew of the genus *Sorex*; length about 6 inches; cinnamon-rufous above. Pacific Coast from Point Reyes, California, to Yaquina Bay, Oregon.

Pygmy Shrew, or Hoy's Shrew.— *Microsorex hoyi* (Baird). Smallest of all the Shrews and smallest North American mammal; total length, 3.2 inches; tail vertebrae, 1.25 inches; sepia-brown above, paler below. Wisconsin to North Dakota and British Columbia.

Short-tailed Shrew.— *Blarina brevicauda* (Say). See special synopsis.

Water Shrew.— *Neosorex palustris* (Richardson). See special synopsis.

Photograph by West Va. University Experiment Station

SHORT-TAILED SHREW

Shrews are even less known than Moles, due to their retiring disposition, but are hardly less numerous

"Considering the abundance of these animals," says Samuel N. Rhoads, "it seems strange that the name 'Shrew' has not come into more general use, especially among persons who live in the country and see them often. When referred to on the farm they are almost invariably designed 'Mole' or 'Mouse' and the name 'Shrew' is scarcely recognized as belonging to a North American animal. The Shrews constitute a family by themselves, however, and may very easily be distinguished from the Moles by their smaller size and Mouse-like fore feet, and from the Mice by their pointed nose, small eyes and finer fur."

The Common Shrew has a wider range than any other of the long-tailed group; indeed its area of distribution is larger than that of any other American species, extending across the entire continent from Alaska to New England except the southern Rocky Mountains and the Cascade-Sierra systems. In the South it is found in the higher Alleghenies to Tennessee and North Carolina. It is known by various names, as Cooper's Shrew, the Masked Shrew, and the Shrew Mouse.

This diminutive animal makes its home in the hollow parts of fallen trees, under wood piles or logs, or in any sheltered place where it is likely to be undisturbed. It does not burrow; but Mr. Theo. H. Scheffer, of the U. S. Biological Survey, has found that it is a frequent trespasser in the underground galleries of the Mole. Though not aquatic, it prefers to dwell near some small stream that will not freeze in winter nor run dry or stagnate in summer. A very dry summer means death to numbers of

Shrews. In winter the Common Shrew may be seen poking its snout into the little openings in the bark on the lower parts of tree-trunks, and ferreting about in the leaf mold or among pieces of decayed wood for its daily bread. It is supposed that the species mates without much regard to seasons, but on this point little is known definitely.

The ears of the Shrew are more evident than those of the Mole. The toes are furnished with claws, usually five on each foot. Shrews, however, never walk on their toes, but plant the greater part of the sole on the ground. Many of the species have glands, usually on the sides of the body, which emit a noxious odor when the animal is frightened or enraged, serving to protect it from many, but not all, of its forest enemies. Weasels, owls of all kinds, and some hawks kill and eat Shrews; but the mink, fox, most of the hawks and domestic cats, though they frequently kill them, only feed on them when forced by hunger to do so.

The Shrew's fur, like that of the Mole, is soft and silky, and all of the American species have their summer and winter coats. The summer pelage is usually sepia brown or chestnut; the winter one, dusky or ash-gray or lead-colored.

Shrews, so far as known, do not hibernate, nor do they seem to lay by provision for the winter, so that they are necessarily compelled to hunt unceasingly for their food in all kinds of weather and at all seasons of the year.

Considering its size, the Shrew may be considered one of the most pugnacious of all animals. Mr. Fred E. Brooks says: "I recently placed a Shrew, about two-thirds grown, in a box with a mature and very large Meadow Mouse. They lived together for about a week before they were separated, but the relationship between the two seemed at all times to be decidedly strained. Each seemed to fear the other, although the Mouse was at least four times the size of the Shrew. I fed the two a great many grasshoppers, of which both were very fond. The one that got hold of a grasshopper first would keep it without personal violence being resorted to by the other for its possession. When the Mouse was eating food that the Shrew desired, the latter would often take a position near at hand, usually at the mouth of one of its burrows in the moss with which the box was partly filled, and indulge in a peculiar and rather amusing performance. With its mouth wide open and its snout and lips drawn back so as to expose its sharp teeth, it would throw its head rapidly from side to side and give forth a peculiar, song-like chatter consisting of a series of rapidly repeated chirps, pitched on a high key, and varied every few seconds with a long-drawn, rasping note on a lower key. While thus engaged it would assume a perfectly fiendish look and express in the most realistic manner all the anger and envy and hate that was in its little heart."

House Mice, White-footed Mice and Meadow Mice, when confined in a cage with Shrews, will often manifest the most abject terror, and will jump and rush about as though panic-stricken until exhausted. The evident hate and fear with which they regard the Shrews indicate that they recognize in them a natural and puissant enemy which for reasons of personal safety they must avoid.

The *Pygmy Shrews* deserve especial notice as they occupy a group by themselves, which contains three species. The smallest of these, and in fact the smallest of all our mammals, is Hoy's Shrew. This diminutive creature has a total length of only a little over three inches, the tail measuring one-third of this; so the little body is about two inches long. The pelage is chestnut-brown with a little hoariness in the upper parts; the under parts dull rusty white. Its range is a wide one, extending from British Columbia to Labrador.

Practically nothing is known of the habits of this little animal. Mr. G. S. Miller, Jr., says: "Hoy's Shrew avoids bogs and heavy woods. At North Bay I invariably found it in dry clearings and gardens. The one taken at Peninsula Harbor was found by a dog under the rotting trunk of a small tree in an open upland prairie. A female taken at North Bay had only four mammae."

SHORT-TAILED SHREW

Blarina brevicauda (*Say*)

Other Name.— Mole Shrew.

General Description.— A typical Shrew resembling superficially the Common Shrew but much larger, with heavier body, and very short tail. Head pointed; ears short; eyes small; legs short; pelage soft and glossy.

Dental Formula.— Incisors, $\frac{4-4}{2-2}$; Canines, $\frac{1-1}{0-0}$; Premolars, $\frac{2-2}{1-1}$; Molars, $\frac{3-3}{3-3}=32$.

Pelage.— ADULTS: Sexes identical; seasonal variation slight, summer coat paler than winter. Above, sooty plumbeous; below, ashy plumbeous; tail dark above, paler below; pelage very soft and glossy. YOUNG: Similar to adults.

Measurements.— Total length, 5 inches; tail vertebrae, 1 inch; hind foot, .62 inch. Weight, 22 grammes.

Range.— Western Nebraska and Manitoba eastward to the Atlantic Coast.

Food.— Insects and Meadow Mice.

Remarks.— The short-tailed and thick-set body of this Shrew serves to distinguish it from others. It is probably the largest, considered from the point of weight, of all the Shrews. Some nine species are known north of the Rio Grande.

RELATED SPECIES

Common Short-tailed Shrew.— *Blarina brevicauda brevicauda* (Say). Typical animal of the above description. Western Nebraska and Manitoba eastward to the Atlantic.

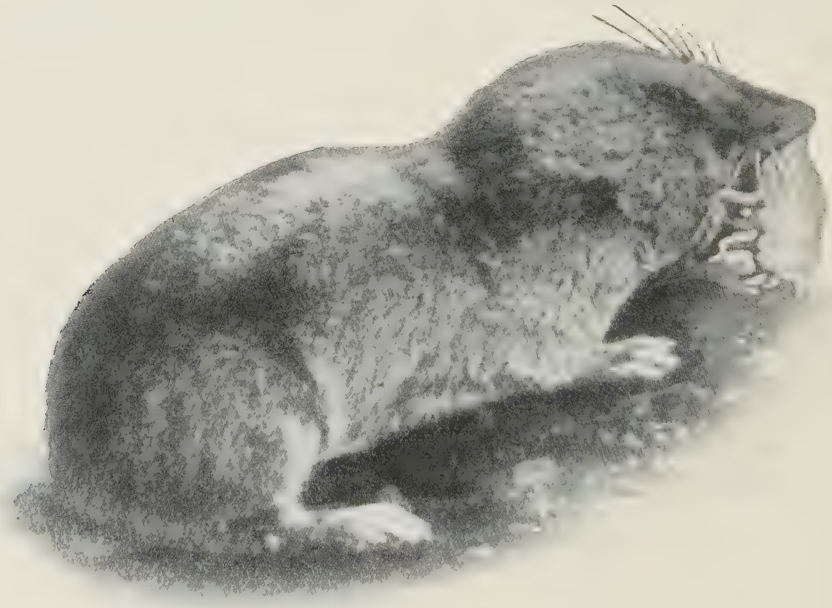
Carolina Short-tailed Shrew.— *Blarina brevicauda carolinensis* (Bachman). Smaller than the Common Short-tailed Shrew and generally browner. From mouth of Chesapeake Bay to Arkansas.

Florida Short-tailed Shrew.— *Blarina brevicauda peninsulae* (Merriam). Color more slaty and hind feet larger than the Common Short-tailed Shrew. Peninsula of Florida south of latitude 28°.

Small Short-tailed Shrew— *Cryptotis* (= *Blarina*) *parva* (Say). Size very small; teeth, 32 in number; upper parts dark hair-brown; under parts ashy-gray; total length about 3.12 inches. Eastern United States from Texas and eastern Nebraska, eastward to the Atlantic Coast.

The Short-tailed Shrew differs both in characters and in habits from its long-tailed cousin. As its popular name indicates, it resembles the Common Mole, for which animal it is often mistaken. It is equally often supposed to be a Field Mouse, its lead-colored pelage contributing to this illusion.

" It is surprising how few, even among very intelligent people, have the remotest conception of what constitutes a Shrew," observes Samuel



Photograph by the West Va. University Experiment Station

SHORT-TAILED SHREW

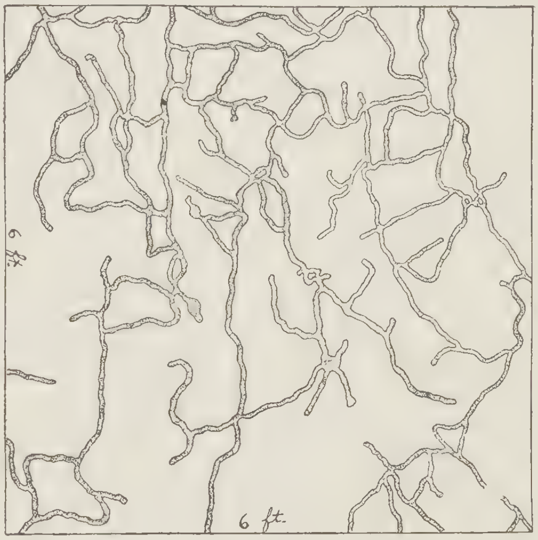
An excellent life-size photograph of an animal that is often mistaken for the Mole

N. Rhoads. "I venture that ninety per cent of the persons I have conversed with on the subject have had no idea of Shrews other than the kind depicted in Shakespeare's comedy, and when I gravely state to them that I have caught so many Shrews the effect is rather amusing. Though rarely seen, even by the most curious observers of nature, the subject of this article far outnumbers any other species of native mammal found in eastern North America.

"This species stands pre-eminent above all others of our mammals in its abundance and universality of distribution in all conceivable situations. Not a place have I trapped over in the two States (New Jersey and Pennsylvania) but what it was among the first to be caught. It is found in our deepest, coldest mountain ravines, on the stony, barren mountain top, in the banks and valleys of low tide-water streams and the maritime marshes, and delights in roving from the cool sphagnum bogs of the New Jersey cedar swamps, where the temperature may be below 60 degrees, to the hot sand barrens of the adjoining fields with a midday heat of 110 degrees. Forest and plain, sand and clay, barren or fruitful fields, backwoods and dooryard, heat and cold, wet and dry, day and night, have common charms for this little cosmopolite."

Like other members of the family it is both insectivorous and carnivorous, depending almost wholly on animal food for subsistence, and with its near kinsman the Mole, which it greatly resembles, is supposed to feed principally on worms. In view of their great numbers we naturally ask what economic relations they bear to man and to nature. Undoubtedly the purely mechanical effect of their universal burrowing and rooting in the soil is an important factor. It is known that they subsist to some extent on vegetable food, chiefly nuts, but they do only indirect damage to agriculture by disturbing the roots of plants. On the other hand, there is little doubt that they destroy an amazing number of noxious grubs, beetles and worms, and it is probable that the part they play as underground scavengers is important. They also do much in checking the increase of the native Mice of our meadows and woodlands.

Theodore Roosevelt says: "When a boy I captured one of these Mole Shrews and found to my astonishment that he was a blood-thirsty and formidable little beast of prey. He speedily killed and ate a partially grown White-footed Mouse which I put in the same cage with him. (I think a full-grown Mouse of this kind would be an overmatch for a Shrew). I then put a small snake in with him. The Shrew was very active, but seemed nearly blind, and as he ran to and fro he never seemed to be aware of the presence of anything living until he was close to it, when he would instantly spring on it like a tiger. On this occasion he attacked the little snake with great ferocity, and after an animated struggle in which the little snake whipped and rolled all around the cage, throwing the Shrew to and fro a dozen times, the latter killed and ate the snake in triumph."



From West Va. University Experiment Station

Diagram showing burrows used by Short-tailed Shrews in searching for insect food. The burrows occurred in thirty-six square-feet of ground under a chestnut tree in the woods

That they prey upon each other on occasion is also certain. Dr. Merriam once confined three of them under an ordinary tumbler. Almost immediately they commenced fighting, and in a few minutes one was slaughtered and eaten by the other two. Before night, one of these killed and ate its only surviving companion. The appetite of these Shrews is simply enormous; it is estimated that they consume twice the weight of their own bodies in twenty-four hours. The same observer states that they are fond of beechnuts, and will eat corn and oats at a pinch. "One evening not long ago," he relates, "I put a handful of beechnuts in a Shrew's water saucer. He soon found them and carried them off. Part he buried in a hole under the saucer, part under his nest, and the rest in an excavation near one corner of the box. This certainly looks as if the animal was in the habit of hoarding for the winter."

Unlike the Long-tailed Shrews, this species is to a certain extent a digger. It burrows just beneath the surface of the ground in summer, and makes furrows in the snow in winter; and, unlike the true Mole, it spends much of its time in the open air from preference, running about over the fallen leaves of the forest or along the shaded galleries of stone walls, which it is as fond of following as is the Weasel. The result of the digging habit is probably to be seen in the size of the fore feet, which are larger and broader than the hind ones.

Of the domestic habits of the Mole Shrew we know very little, and that, in a general way, would seem to point to anything but conjugal felicity or fidelity, and their fraternal relations may safely be set down as below par. The first pairing season is probably in April, and two or three litters are produced each season. The mother builds a nest of grass and leaves in dry, underground situations, to which it resorts not only for its own shelter, but for that of its young. Four to six young compose a litter, and, as with our native Mice, the young are born at all seasons of the year, though less frequently in the winter time.

WATER SHREW

Neosorex palustris (*Richardson*)

Other Names.— Marsh Shrew, Beaver Mouse.

General Description.— Similar in many respects to Common Shrew but much larger. Nose pointed, elongate; ears inconspicuous; body moderately slender; tail quite long, nearly half total length; fore feet short; hind feet larger, adapted for swimming, having white fringes of bristle-like hair; pelage very soft.

Dental Formula.— Incisors, $\frac{4-4}{2-2}$; Canines, $\frac{1-1}{0-0}$; Premolars, $\frac{2-2}{1-1}$; Molars, $\frac{3-3}{3-3}=32$.

Pelage.— ADULTS: Sexes identical, no noticeable seasonal variation. Pelage very thick and soft; above, dusky brown to very dark gray sprinkled with hoary; under parts white, silvery in some lights; the white of the under parts meeting the dark sides in a sharply defined line; tail above and at tip, seal brown; below white. YOUNG: Similar to adults.

Measurements.— Total length, 6 inches; tail vertebrae, 2.7 inches; hind foot, .75 inch.

Range.— Minnesota to east base of the Rocky Mountains, north to 64° latitude.

Food.— Mainly insects.

Remarks.— The Water Shrews are easily distinguished from the other Shrews not only by their larger size but by the sharply contrasting color pattern of slate-gray above, white below, and by their specialized feet. There are eight species and subspecies divided into two subgenera, having for their most conspicuous superficial difference the degree of contrast between upper and lower parts, the first, or *Neosorex*, group being sharply bicolored animals; the second, or *Atophyrax* group, having under parts more like upper parts.

RELATED SPECIES

Water Shrew.— *Neosorex palustris* (Richardson). Typical animal as described above. Minnesota to east base of Rocky Mountains.

Rocky Mountain Water Shrew.— *Neosorex navigator navigator* (Baird). Smaller than Common Water Shrew. Rocky Mountains and outlying ranges from British Columbia to southern Colorado, and the Sierra Nevada of California.

New England Water Shrew.— *Neosorex albibarbis* Cope. Similar to Common Water Shrew but under parts dusky. Eastern North America from Mountains of Pennsylvania and New York northward to Labrador.

Bendire Water Shrew.— *Neosorex bendirii bendirii* (Merriam). A member of the subgenus *Atophyrax;* Size large, tail long; sooty plumbeous above, paler below; tail dusky; not bicolor. Klamath Basin, Oregon, northward along east sides of Cascades to Puget Sound, westward to coast of California.

The group of Swimming Shrews have large feet, the hind ones being very long, broad, and fimbriate; the toes are all fimbriate, the third and fourth being united at the base and slightly webbed. These aquatic Shrews are of very large size, and have very long tails, and are found on the borders of streams, lakes, and marshes.

The Marsh Shrew ranges from central Minnesota to the east base of the Rocky Mountains. It is six inches in length, the tail exceeding two and one-half inches; its feet are fringed with white bristle-like hairs. Its fur is sooty brown mixed with hoary above, and the under parts are grayish white. The tail is silver white beneath and dusky above. It is a good swimmer, and has been called the Beaver Mouse by the Indians, on account of its presence in the houses of the Beaver. Little is known concerning its habits. Mr. Seton captured one in the runway of a Marsh Mouse, and he concludes that "it preys on them regularly." The captured specimen was "a female evidently suckling young."

ORDER OF BATS

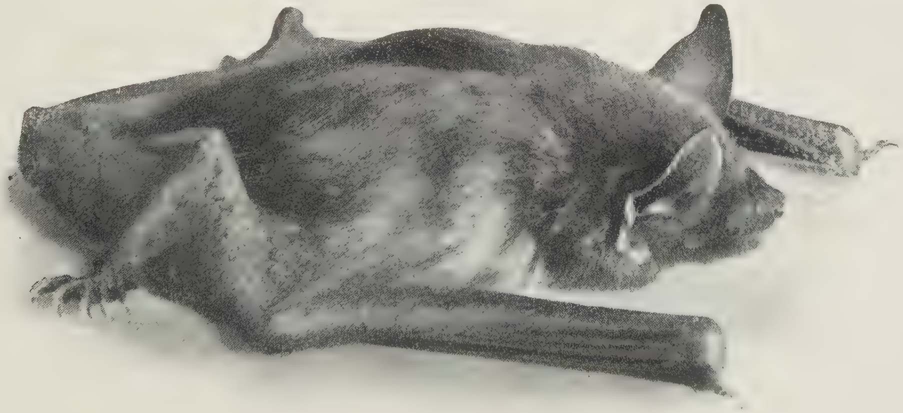
(*Chiroptera*)

ONE of the strangest of all animals is the Bat. Partaking in its powers of flight of some of the habits of the birds, it is nevertheless a true mammal. It cannot even be regarded as a connecting link between the two kingdoms.

Bats occupy an order by themselves, which is as sharply defined as could be devised. They do not encroach upon any other order; neither do other mammals show traits belonging to the *Chiroptera*. The members of this order are true mammals with the fore limbs modified for flight. The bones of the arms and fingers are enormously elongated and drawn out; across this slender framework extends the flying membrane, a thin fold of skin, which reaches to the sides of the Bat; and from the fingers to the hind limbs on the ankle joint a cartilaginous process, the calcar, helps to support another portion of the flight membrane, which extends from ankle to ankle and envelops more or less of the tail. Peculiar modifications to further the power of flight are the rudimentary ulna, the long curved radius, the short thumb bearing a claw and long fingers with no claws, and the outwardly-directed knee joint. Other structures characteristic of Bats are the specialized ears with the peculiar upstanding process, the tragus, the thoracic mammary glands, and often accessory structures upon the nose and lips.

Bats are night-loving animals. Their flight is erratic and often swift despite the fact that their eyes are quite small. They are widely distributed over America, as well as over other countries, but, because of their secluded habits and love of darkness, few persons know much about them.

The Order is divided into two sub-orders — the *Megachiroptera*, or Fruit-eating Bats found only in the Old World; and the *Microchiroptera*, the Insect-eating Bats, of smaller size, which are found in nearly every land.



Photograph by Dr. R. W. Shufeldt

BROWN BAT WALKING

A photograph from life showing the animal's peculiar manner of walking forward on a flat surface

COMMON BROWN BAT

Eptesicus fuscus *(Beauvois)*

Other Name.— Big Brown Bat.

General Description.— A small flying mammal with leathery membrane stretched across the greatly elongated fingers and extending along sides of body to include the hind legs and tail. Head small; nostrils simple; eyes minute; ears large and broad, with a broad tragus or process on anterior part of ear conch; fore limbs elongate with fingers enormously elongated, slender, and only the thumb, which is short and rudimentary, provided with a claw; body small and muscular, especially thick through the chest; hind limbs much shorter than fore limbs, slender, with five toes, each bearing a claw, the toes of nearly equal length; tail fairly long, nearly half of total length and completely enclosed in the interfemoral membrane; flying membrane extending from the fingers to sides, to the ankle, and thence to include the tail, naked everywhere except for a few scattered hairs on back of interfemoral membrane; body covered everywhere with long soft fur of a brown color, paler below. Strictly a nocturnal mammal and insectivorous.

Dental Formula.— Incisors, $\frac{2-2}{3-3}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{1-1}{2-2}$; Molars, $\frac{3-3}{3-3} = 32$.

Pelage.— ADULTS: Sexes identical; seasonal variation slight. Everywhere above, dark brown or sepia; underparts paler; ears and membranes blackish. YOUNG: Rather darker than adults.

Measurements.— Total length, 4.5 inches; tail vertebrae, 1.7 inches; hind foot, .4 inch; forearm, 1.7 inches; spread of wing, 12 or 13 inches.

Range.— Greater part of the United States and adjoining British provinces.

Food.— Strictly insect-eating; mainly small forms caught on the wing.

Remarks.— There are only five subspecies of the Big Brown Bat found north of the Rio Grande. However, the Bats in general are a very large group containing many forms, some of them bearing considerable superficial resemblance to the Big Brown Bat and for this reason are listed in the related species. Most of the Bats found in the United States belong to the same family as the Big Brown Bat, and consequently the relationships are quite close between any two species.

RELATED SPECIES

Common Brown Bat.— *Eptesicus* (=*Vespertilio*) *fuscus fuscus* (Beauvois). Typical animal as described

Photograph by J. H. Field

A NOON-DAY NAP

Living Bat of Common Brown species, asleep on the top of a post above. Greater part of the United States and southern Canada.

Florida Brown Bat.—*Eptesicus fuscus osceola* Rhoads. Color more cinnamon-brown. Florida and Gulf States to Texas.

Pallid Brown Bat.—*Eptesicus fuscus pallidus* (Young). Much paler than Common Brown Bat; brownish-ashy above. Colorado.

Florida Bat.—*Dasypterus floridanus* Miller. Appearance much like that of Common Brown Bat but interfemoral membrane furred on dorsal half; color light yellowish-brown. Florida and Gulf Coast west to Louisiana.

Rafinesque's Bat.—*Nycticeius humeralis* (Rafinesque). Smaller than Common Brown Bat, with tip of tail free of the membrane; umber-brown above. Eastern United States west to Arkansas and southern Texas.

Big-eared Bat, or Lump-nosed Bat.—*Corynorhinus macrotis macrotis* (LeConte). Size about that of Common Brown Bat; ears enormous, 1.25 inches high, joined at base; a thick club-shaped enlargement between eyes and nostrils; yellowish-brown above, grayish-white below. Eastern United States in southern portion.

Spotted Bat, or Jackass Bat.—*Euderma maculatum* (Allen). Ears even larger than those of Big-eared Bat, about 1.5 inches high by nearly an inch wide; nose without any excrescences; color peculiar in being distinctly spotted, a white spot on each shoulder and one on rump, and whitish areas at base of ears and upper sides of neck; fur elsewhere above dark sepia; below fur black at base, white at tips; size about that of Common Brown Bat. Scattered localities in the Southwest; California, New Mexico and Arizona.

Pale Bat.—*Antrozous pallidus pallidus* (LeConte). Size that of Common Brown Bat; ears large; tragus tall, slender, straight; drab-gray above, grayish-white below. Desert region of eastern California, Nevada, Arizona, New Mexico and western Texas.

Silvery-haired Bat.—*Lasionycteris noctivagans* (LeConte). Somewhat smaller than Common Brown Bat but general proportions much the same. Has 4 premolars, but otherwise the dental formula is the same. Head small; ears short, not so broad as long; tragus short and straight, rounded at tip; body small; wings large; hind feet slender; interfemoral membrane extensive, furred for about half its width above; tail fairly long but less than half total length; general color sooty brown with the hairs silver-tipped. Total length, 4 inches. A common Bat in many regions.

Little Brown Bat.—*Myotis lucifugus lucifugus* (LeConte). See special synopsis.

Least Brown Bat.—*Pipistrellus hesperus hesperus* (H. Allen). See special synopsis.

Red Bat.—*Lasiurus borealis borealis* (Müller). See special synopsis.

One of the strangest of all animals is the Bat. A true mammal, it yet has habits in common with the birds; while among the different species the variety of forms it exhibits is fairly bewildering. All over the world they are found, the total number of species being about 1200; but a large proportion of these are known only by their skins or skeletons in some museum.

The largest Bats are found in the tropics. The United States, being in a temperate zone, contains only a few of the smaller species. All Bats living in the colder regions must either hibernate in winter, or migrate.

The lack of common knowledge about Bats is remarkable. Many persons fear them, although our native Bats are weak and harmless. The great majority of Bats are useful to man in destroying bugs and insects. The more dangerous species, such as blood-suckers, or Vampires, inhabit the tropics. "To be 'as blind as a Bat' is not to be blind at all," says Hornaday, "but rather to possess powers of vision that are uncommonly good in semi-darkness, or at night, and fairly good even in the broad light of day. When disturbed at midday, all the Bats I have seen alive (perhaps twenty species in all) have flown away to places of security as briskly and successfully as so many swallows. The eyes of all night-flying Bats are small, jet black, and look like tiny black beads, but those of the day-flying Fruit-Bats are very much larger in proportion."

As previously remarked, very little is known regarding the habits of the Bats, chiefly because their nocturnal habits make it very difficult to find them, or to observe them. We know that in winter some of our species live in caves, in a semi-dormant condition. Dr. C. H. Eigenmann says, of the thousands that inhabit Mammoth Cave, "they fly readily if disturbed in the summer, but in winter they hang apparently dead. If disturbed, a few respiratory movements may be seen, and they may utter a few squeaks, when they again remain apparently lifeless. If knocked from the roof some of them fall to the bottom of the cave and flap about, others fly away. I have seen them leave a cave in midwinter, after being disturbed, but fly no further than a hundred yards, then turn and enter the cave again."

In central Montana, where there are no trees, a large colony of Bats inhabit a cave that a subterranean stream had washed under the prairie. In Arizona there is a cave which is said to contain "a million" Bats. "Once while hunting Elephants in the Malay Peninsula," says Hornaday, "the attention of my companion and myself was arrested by a strange, pungent odor which filled the air. Upon investigating the cause of it, we discovered a large cave of a very interesting character, inhabited by thousands of Bats, and floored with a layer of Bat guano a foot or more in depth, representing the accumulation of a century."

In the warm countries, Bats inhabit hollow trees. But it is questionable whether they inhabit such homes and actually hibernate in them in winter, in the temperate zone, or migrate. Dr. C. Hart Merriam has proved that some Bats of the North American temperate zone do migrate, as birds do, going south in winter and returning in spring.

From their swift flight through the air, we might think that Bats had wings like birds, but birds have feathers, while Bats are covered with soft fur. Their wings are not like those of a bird, but consist of a tough, leather-like membrane, or skin, which extends from the sides of the body to the ends of the feet.

The legs are very slender. The hind feet are provided with claws, and from the extremity of the fore legs or hands are four long, bony fingers that pass through the membrane which forms the wings, and support it. At the top of the wing is the thumb, with a sharp claw that is a very useful hook. Bats can fold their wings by drawing them close to their body as one would close an umbrella. When they rest or sleep, these odd creatures hang head downward, holding to their perch by means of the claws of their hind feet.

Bat's wings seem to have a delicate nervous organism, which enables them to feel that they are approaching an object before they have actually touched it, and then they quickly alter their course and fly in another direction. They depend more upon their sense of feeling than upon sight, and this explains why a Bat which has almost touched an object will suddenly wheel away to avoid contact.

The Bat's flight, while seemingly aimless, is actually purposeful; for it is while flying that the Bat gets his food. He feeds wholly upon insects, chiefly those that fly by night, and at every sudden turn we see him make, we may assume that he has captured an insect.

The Big Brown Bat, which is called also the Carolina Bat, House Bat, and Serotine Bat, is one of the commonest Bats in the Middle States, but is also found in other states from Oregon to Maine, as far north as Lake Winnipeg, and southward to Central America. It is nearly five inches long, with a wing expanse of twelve inches or a little over. Its ears are of medium length and slightly pointed. Its fur, which is silky in texture, is dark brown above and somewhat lighter below.

Brown Bats make their appearance late in the evening; they fly lower than the Red Bats; and they may always be distinguished by their great size. They have enormous appetites, and drink a good deal. Dr. R. W. Shufeldt is authority for the statement that one specimen, in the course of a single night, consumed twenty-one full-grown June bugs, leaving only a few legs and the hard outside wing-sheaths. Nothing is known concerning the breeding of this Bat. Of its habits, Stone and Cram write: "The large Brown Bat is seen late in autumn and on mild evenings in mid-winter, and they not infrequently fly into houses during the latter season and seek temporary shelter, only to sally forth again the next night to the terror of certain of the occupants of the bedrooms, causing an excitement that could scarcely be surpassed were they the famous Vampires of the tropics. In summer-time they still more frequently enter houses in the evening in pursuit of flies and other insects which are attracted by the lights, and pass back and forth wheeling and twisting with the utmost dexterity, and always avoiding objects which may stand in their path. Since the introduction of electric lights along the streets of Philadelphia, the Bats are frequently to be seen flying about in their radiance, reaping a rich harvest of their favorite food."

Rhoads, in "Mammals of Pennsylvania," has this to say of the Big Brown Bat: "Among American Bats this species may be said to correspond in its fondness for the homes of man to the Mouse and Rat, or to the robin and the wren among birds. During summer, they are as likely to hang up for day-dreams behind an unused shutter or door, or a crack in the wall, or a shady porch or out-house, as anywhere else. This Bat is accused of bringing bed-bugs and other insect vermin into houses. I have never found any vermin on them except lice of a species not parasitic on man."

Jaws of this Bat have been found among other bones in pellets under the nest of the great horned owl, in southwestern Texas; and in British Columbia rainbow trout have been seen to leap after the Bats as they skimmed the surface of a lake in the evening. The species is supposed to be migratory.

The *Spotted,* or *Jackass Bat* is of very unusual appearance, having enormous ears like the proverbial jackass. It is exceedingly rare, being known from a single specimen only, which is in the American Museum of Natural History in New York. It differs so widely from others that no comparison with any is necessary. Its peculiar color at first suggests albinism, but since the fur is everywhere dark at base, even in the white areas, the pattern is probably normal. Dr. Merriam says of the Spotted Bat: "The type of this remarkable genus and species is believed to have been obtained near San Fernando, Cal. The type specimen remains the only one thus far collected, but the species probably ranges over much of the lower Sonoran Desert region in summer. While in Vegas Valley, Nev., I was told that a very large Bat 'with ears like a jackass and a white stripe on each shoulder' is abundant at that place in the summer, but does not occur in spring or fall." It is probably a migrating species.

Photograph from the American Museum of Natural History

COMMON BROWN BAT

A mounted specimen, showing the enormous wing spread. It is next to impossible to obtain such a picture of the living animal, because of its erratic flight and also because it flies by night

LITTLE BROWN BAT

Myotis lucifugus (*LeConte*)

General Description.— Similar in superficial characters to the Common Brown Bat, but much smaller. Head small; ears more slender and proportionately taller, tragus slender; body small; wings long and narrow; tail quite long but less than half total length; pelage soft, dull-brown in color; membranes not furred except at extreme base of interfemoral membrane. The commonest small Bat of North America.

Dental Formula.— Incisors, $\frac{2-2}{3-3}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{3-3}{3-3}$; Molars, $\frac{3-3}{3-3} = 38$.

Pelage.— Adults: Sexes identical; seasonal variation slight. General color somewhat variable in shade but usually dull brown; beneath pale brown tinged with gray or yellowish; membranes blackish. Young: Similar to adults.

Measurements.— Total length, 3.6 inches; tail vertebrae, 1.4 inches; hind foot, .4 inch; expanse of wings, 9 inches.

Range.— Whole of North America north of the Rio Grande, except in the Rocky Mountains and on the Pacific Coast.

Food.— Insects.

Remarks.— The Little Brown Bat is a member of a genus that has become differentiated into a great many species and subspecies, all, however, showing their relationship by their general similarity to one another. Some 21 species and subspecies are known north of the Rio Grande.

Related Species

Little Brown Bat.—*Myotis lucifugus lucifugus* (LeConte). Typical animal of the above description. Nearly whole of North America.

Large-eared Little Brown Bat.—*Myotis velifer* (Allen). Ears long; size large for the genus; fur dull sepia throughout, paler on belly; total length, 4 inches. Southern United States into Mexico.

California Little Brown Bat.—*Myotis californicus californicus* (Audubon and Bachman). Size very small; total length, 3.15 inches; yellowish-brown above, paler below. Western United States east to Wyoming and Texas.

Pallid Little Brown Bat.—*Myotis californicus pallidus* Stephens. Size small; ears small; above, light ochraceous-buff; below, dull-white. Arid regions of southern California.

Say's Little Brown Bat.—*Myotis subulatus subulatus* (Say). Similar to Little Brown Bat but ears longer and tragus more sharply pointed. North America east of the Rocky Mountains.

The Little Brown Bat is one of the commonest of our small visitors, yet the popular misconception of its appearance and habits is astonishing. Probably forty out of every fifty persons to whom the head of a Little Brown Bat was shown would be unable to name the animal to which it belonged; a few might say it belonged to some kind of Mouse. How many of us know that these little denizens of twilight-land have fingers and thumbs so long that, were a man's built on the same scale, the human fingers would be four feet in length? And what fear one of these little creatures brings upon persons who, at least, ought to know that Bats are not only among the least harmful of animals, but, by their consumption of insects, are really to be classed among man's benefactors.

A typical incident will illustrate the consternation caused by one of these unexpected winged callers. It was in the dusk of a warm September evening. Most of the family were on the piazza, but the daughter of the house was playing the piano in the parlor. Suddenly the music ceased, and a shriek from the performer brought the party from the porch in haste, to discover that a Little Brown Bat, attracted — who knows? — by the strains of Chopin, or, more probably, chasing some insect for supper, had entered the house and was circling round the parlor. Instantly there was commotion and, among the ladies, consternation. The colored butler was hastily summoned to eject the unwelcome intruder, but neither he nor his wife could be persuaded to approach it. After considerable " shooing," the Bat was driven from the room and peace was restored.

The Little Brown Bat is one of the smallest of American Bats, measuring but three or three and one-half inches from snout to tail-tip, and having a spread across the wings of nine inches. Its eyes, which are nearly hidden in its fur, are small and beadlike; and its ears are short and pointed, barely reaching, when thrust forward, to the tip of the nose. Its fur is dark glossy brown above; below, the color is paler and more yellowish. Save for a small strip near the body, the membranes of the wings, as also that of the tail, are quite naked. This Bat can always be distinguished in the air by its eccentric flight.

Little is known of the Little Brown Bat's mating habits. It, in common with all American Bats, does not make any nest. There are usually two young at a birth, and these, according to Rhoads, " cling by their mouths to the teats of the mother until large enough to grasp her body. Thus laden, she pursues her nightly avocations until they can be left 'hung up' in some secret place till her return." Until about three months old the young Bats remain at home and are fed by the mother. The father does not seem to trouble himself much about the welfare of his offspring.

Like the rest of the family, this Bat spends the daylight in caves, or, if it cannot find these, in ruins, hollow trees, and even garrets. In certain parts of Texas, Bats have frequented caverns in such numbers that they have created valuable deposits of guano. It hibernates, at any rate for a season, during frosty weather; and it seems to take advantage of the later warm days to migrate southwards, since it is not known to torpify for all winter.

LEAST BROWN BAT

Pipistrellus hesperus (*H. Allen*)

General Description.— Smallest of the North American Bats. Head small; ears short, tapering to a narrow rounded tip and longer than broad; tragus rather short, very blunt and curved forward; body small; feet small; interfemoral membrane of moderate size, sparsely haired on upper surface next to body; face and ears bare, black; pelage, pale drab. A swift-flying, delicately built Bat.

Dental Formula.— Incisors, $\frac{2-2}{3-3}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{2-2}{2-2}$; Molars, $\frac{3-3}{3-3} = 34$.

Pelage.—Adults: Sexes identical; seasonal variation slight. Above, pale drab; below, brownish-white; all the fur blackish at base; membranes, dull black. Young: Similar to adults.

Measurements.— Total length, 2.8 inches; tail vertebrae, 1.2 inches; ear from crown, .4 inch; expanse of wing, 7.9 inches.

Range.— Western United States from Texas to the Pacific Coast.

Food.— Insects of flying varieties.

Related Species

Least Brown Bat.— *Pipistrellus hesperus hesperus* (H. Allen). Typical animal of the above description. Western United States.

Georgian Bat.— *Pipistrellus subflavus subflavus* (F. Cuvier). Larger than *hesperus;* general color, yellowish-brown. Eastern United States, west to Iowa and southern Texas.

Dusky Least Bat.— *Pipistrellus subflavus obscurus* Miller. Color duller and less yellow than that of Georgian Bat; pale wood-brown above. Central and eastern New York.

The Least Brown Bat deserves special attention because of its diminutive and graceful appearance. It is the smallest of our native Bats, and approaches the Pygmy Shrew in the distinction of being one of our smallest mammals of whatever order. Its body, not measuring the tail, is only about one and one-half inches long. But on account of its expanse of wing — nearly eight inches — this small size of body is not appreciated. This Bat has the delicate mechanism of a watch. It is quick, nervous, alert, and agile. It appears to be among the brightest in mental development. While closely related to the little Brown Bats, the Least Brown Bat is even more delicate. It may be readily told from members of the genus *Myotis* by the shape of the ear and the extent of furring of the interfemoral membrane as well as by its size. Three species of this genus are found north of the Rio Grande.

RED BAT

Lasiurus borealis (*Müller*)

General Description.— About the size of the Common Brown Bat but coloration strikingly different. Head small; nostrils simple; ears broad, rounded at tip, hairy; tragus roughly triangular in outline; body small; wings large; tail long, nearly half of total length and completely included in interfemoral membrane, which is covered with fur on upper surface; general color bright reddish-brown. A common Bat in the eastern United States.

Dental Formula.— Incisors, $\frac{1-1}{3-3}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{2-2}{2-2}$; Molars, $\frac{3-3}{3-3} = 32$.

Pelage.—Adults: Sexes identical; no noticeable seasonal variation. Color variable but ranging from bright reddish-brown to yellowish-red or yellowish; a small whitish patch in front of shoulder; pelage long and soft. Young: Similar to adults, but not as bright until nearing maturity.

Measurements.— Total length, 4.2 inches; tail vertebrae, 2 inches; hind foot, .3 inch; wing expanse, 12 inches.

Range.— Eastern North America from Canada to Florida, and Texas west to Colorado.

Food.— Insects.

Remarks.— This strikingly-colored Bat may be known at once from all the other Bats by its peculiar markings; and all the members of the genus may be told by the furred interfemoral membrane. There are four species and subspecies of this genus found north of the Rio Grande.

Related Species

Red Bat.— *Lasiurus borealis borealis* (Müller). Typical animal of the above description. Eastern North America south to Florida, west to Colorado.

Florida Red Rat.— *Lasiurus borealis seminolus* (Rhoads). Similar to Red Rat but general color mahogany-brown. South Carolina to southern Texas.

Western Red Bat.— *Lasiurus borealis teliotis* (H. Allen). Smaller than Red Bat with shorter ears. California.

Hoary Bat.— *Lasiurus cinereus* (Beauvois). See special synopsis.

Photograph by American Museum of Natural History

A TROPICAL LEAF-NOSED BAT

A mounted specimen showing breadth of wings and smallness of body. A beautiful animal in flight, its brilliant color vying with that of the birds

One of the most beautiful of creatures, vying in brilliance with the birds themselves, is the Red Bat of our Eastern and Southern States. Its name indicates its distinguishing color, a bright reddish brown, paling to yellow. Another mark is its broad, rounded, hair-tipped ears.

Mr. Seton gives this Bat the additional name of "Tree Bat," and says: "The Red Bat is, above all its kin in our country, a tree Bat. In winter it is known to gather in vast numbers in the caves of its more southerly range. As far as these facts go, they point to a migration from the northern part of its range and a hibernation in the southern part." Mr. Witmer Stone adds: "Where dark caves are to be found, these Bats congregate there in immense numbers during the daytime, but in most localities they frequent lofts and garrets which offer them suitable shelter."

The Red Bat is the first to make its appearance in the evenings, even while it is still light, and it often enters houses while hunting its insect prey. In the daytime it may be seen in a variety of places — lofts and garrets, chimneys, and behind shutters. Near Millerton, New York, an observer noticed eight Red Bats that hung up for the day behind the shutters to one of the windows of his bedroom. They did this during the greater part of a fortnight.

Red Bats are great devourers of insects; and it cannot be doubted that among the latter there must be consumed a large number of disease-carriers. Recognizing this fact, the city of San Antonio, Texas, protects Bats by law. Dr. C. A. Campbell, a resident, believes "that the Bat properly protected and developed, in vast numbers, will practically rid the world of malaria." Being of this same opinion, the San Antonio municipal authorities have caused to be erected in that city the first Bat-roost, which is depicted in the *Houston Chronicle* of March 17, 1915. It is a tower-like structure, with openings to admit the Bats, and bears the sign "Municipal Bat-roost."

Nothing is known of the mating habits of the Red Bat, but it is probable that the breeding season is October, as very young Bats have been found in May and early June. The usual number of young is probably four. On June 18, 1902, an adult female Red Bat was brought alive into the National Museum at Washington, D. C., with a young one at each of her nipples, where it held on with great tenacity, having in its mouth a good deal of its mother's hair, into which its hooked milk teeth firmly caught. Three of the young Bats were females and one was a male, and the combined weight of the four was 12.7 grammes, the mother's weight being but 11 grammes. How she was able to sustain such a weight in her nightly flights is one of the secrets of Bat life.

HOARY BAT

Lasiurus cinereus (*Beauvois*)

General Description.— One of the largest North American Bats. General characters of the Red Bat, but coloration much different. A beautiful Bat of striking appearance.

Dental Formula.— Same as Red Bat.

Pelage.— Sexes identical; no seasonal variation. Upper pelage blackish at base, the middle of the hairs pale yellowish-brown, the tips distinctly hoary-white; head ochraceous; breast and much of belly similar to the back; remainder of lower parts grayish-buff; fur on underside from elbow to wrist.

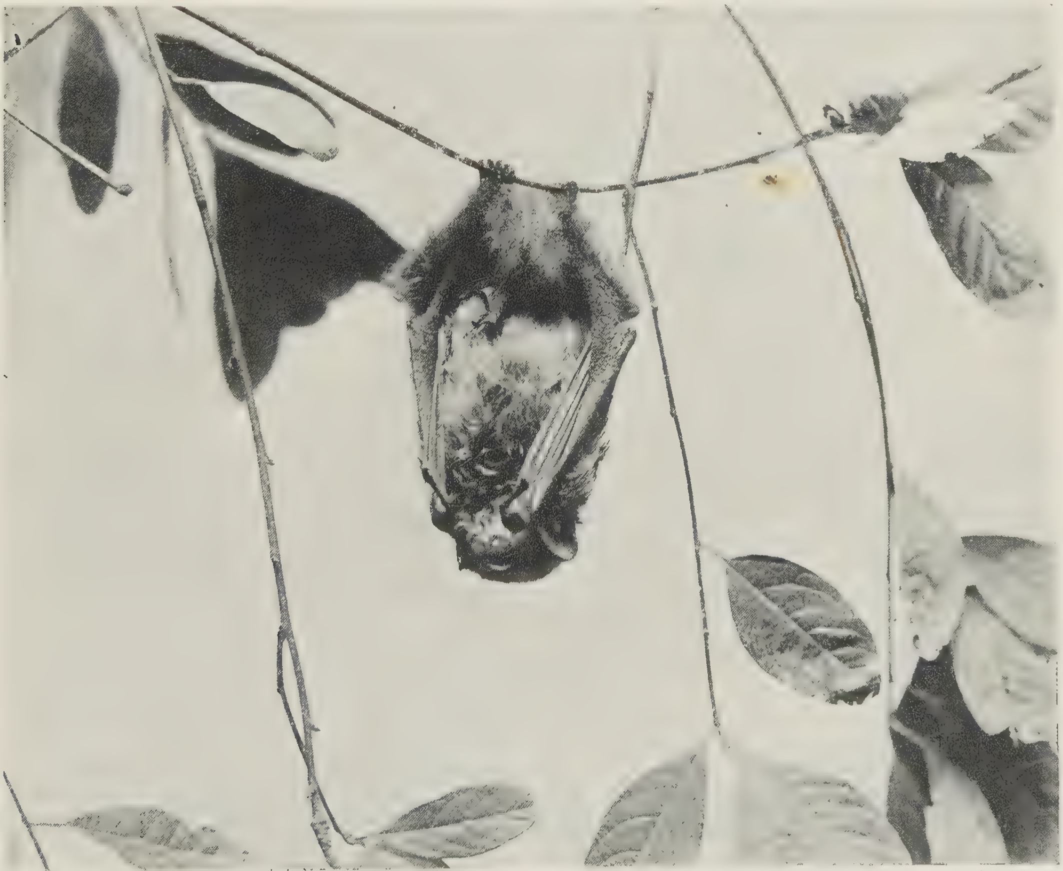
Measurements.— Total length, 5.5 inches; expanse of wings, 16 inches.

Range.— Boreal North America from the Atlantic to the Pacific.

Food.— Insects.

Remarks.— Color variation is considerable, but never enough to obscure the character of the species. It appears to be wholly independent of locality, as skins from such widely separated localities as Minnesota and southern California are found to be extremely hard to distinguish apart.

Among the "Winged Brownies of the Woods," as Mr. Seton calls them, one of the notables is the Hoary Bat, sometimes termed the Great Northern Bat. He does not come abroad of evenings with the common Bat herd; not until "the twilight is fast fading into night, and your eyes fairly ache from the constant effort of searching its obscurity," does this rare animal appear in Shadowland. Nor is he one of the numerous low-flying crowd; "far above the tree-tops of the forest where fly the great luna moths and the cecropias, with others half as big



By permission of the American Museum of Natural History

Photograph by G. Clyde Fisher

RED BAT

This picture was taken in Delaware, N. J., the animal hanging from a twig, asleep as itself and worthy of its powers," will you see this rarest of all the Eastern species of Bats, or darting downward, to drink of a neighboring brook, and again shooting up with lightning speed.

The Hoary Bat is perhaps the largest of all the Bats of the Northern and Middle States. It is much larger than the Red Bat, being from five to five and one-half inches in length, and having a wing spread of fifteen to seventeen inches. Its ears are broader in proportion to their length than those of the Red Bat.

The range of the Hoary Bat is as wide as the continent. Specimens have been found in at least eighteen States; also in Canada and Mexico. As to its local range, Dr. Merriam says: "Its nightly range is vastly greater than that of any of its associates. While the other species are extremely local, moving to and fro over a very restricted area, this traverses a comparatively large extent of territory in its evening excursions, which fact is probably attributable to its superior powers of flight."

According to Miller, the Hoary Bat breeds within the Boreal zone; and Merriam thinks "there can be no reasonable doubt" that the mating time is about the first of August. In 1883, between July 30 and August 6, he saw more Hoary Bats than he has "seen in all before and since, and twelve adult specimens killed during that brief period were all males. They were not feeding, but were rushing wildly about, evidently in search of the females." The young are born in late May or early June, the usual number being four. During June and July the young Bats grow quickly. The mother leaves them in the den or lurking-place, often a knot-hole in a hollow tree, screened from hawk or marten, and too small to admit those enemies of the Bat tribe. The mother Bat strips the bodies of moths and other insects of their limbs and hard casings and brings the soft parts to her young ones. One meal at evening twilight and another at morning twilight is the order of feeding in Bat circles. The young Bats soon learn to fly and are taken out nightly by their mother. The Hoary Bat is very particular about its toilet, cleaning its fur like a cat.

Among the enemies of the Hoary Bat must be listed, besides such four-footed ones as the marten, the blue jay, horned owl, and hawk.

Like its red cousin, the Hoary Bat is migratory. This fact is attested by observations in Canada, by those of Dr. E. A. Mearns in the Hudson Highlands of New York, where, during the first week of November or a little earlier, great flights of them have been seen, and by those of S. N. Rhoads, who has "observed this species returning apparently from extensive flights over the ocean on the New Jersey coast in the early morning before sunrise." Miller, too, in August and September, saw the appearance and disappearance of three species of Bats, among which was the Hoary Bat, at Highland Light, Cape Cod, Massachusetts. As with the Red Bat, in migrating the males fly in one flock and the females in another.

LITTLE FREE-TAILED BAT

Nyctinomus cynocephalus (*LeConte*)

General Description.— A small, dark-colored Bat with the tail partly free of the usual interfemoral membrane. Head small; muzzle blunt, with thick upper lip; long bristles on face; ears broad and almost meeting at their inner margins; body small; wings narrow; long hairs on back of all the toes; pelage rather shorter and more velvety than that of other Bats.

Dental Formula.— Incisors, $\frac{1-1}{3-3}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{2-2}{2-2}$; Molars, $\frac{3-3}{3-3}=32$.

Pelage.— ADULTS: Sexes identical, seasonal variation slight. Above, and on sides of neck, dusky-brown or plumbeous; under parts and sides paler; hairs of upper parts and sides of neck white at the base; elsewhere unicolor. YOUNG: Similar to adults but blacker.

Measurements.— Total length, 3.5 inches; tail vertebrae, 1.2 inches; hind foot, .3 inch.

Range.— Southern United States.

Food.— Insects.

RELATED SPECIES

Little Free-tailed Bat.— *Nyctinomus cynocephalus* (LeConte). Typical animal as described above. Southern United States.

Mohave Bat.— *Nyctinomus mexicanus* (Saussure). Color sooty-gray, below smoke-gray. About the same size and with markings of the Free-tailed Bat. Arizona and California.

California Mastiff Bat.— *Eumops californicus* (Merriam). Size very large; total length, 6.4 inches; ears united at base and very broad; a glandular swelling in front of each eye; sooty-brown, paler below. Southern California.

The Little Free-tailed Bat is a typical member of the family, and is perhaps more numerous in the southern United States than others. It is a small, dark-colored Bat with several strong marks of identification, such as the tail free for nearly half its length from the membrane that envelops the entire tails of other Bat families. Besides this it has bristles on its face, as though it were sadly in need of a shave; and its fur has a softer feel than usual. Its dark color and velvety pelage are also good characters for identification. Its nearest relatives are other Bats, free-tailed like itself and belonging to the family *Molossidae*. Of this group only five or six venture further north than the Rio Grande.

It is a sociable animal, almost always being found in large colonies, when present at all. It ventures forth early in the evening, evidently following the motto that the early Bat catches the insect. It flies quickly and unerringly, and seems to see pretty well in almost any sort of light verging from the failing light of sundown to total darkness.

Another member of this family which deserves notice is the California Mastiff Bat, one of the largest of all Bats found in North America. It is over six inches long, including the tail; and when its wings are spread out in flight it presents an imposing appearance. It is found in Southern California.

CALIFORNIA LARGE-EARED BAT

Macrotis californicus *Baird*

Other Name.— California Leaf-nosed Bat.

General Description.—A medium-sized Bat with tall, broad ears. Head small; nostrils simple; nose contains an erect, simple "leaf" of cartilage and skin; ears very large, connected at bases; tragus slender, pointed; wings broad, not furred; body of normal proportions; interfemoral membrane small, concave in outline; tail extending beyond interfemoral membrane and nearly one-half the total length.

Dental Formula.— Incisors, $\frac{2-2}{2-2}$; Canines, $\frac{1-1}{1-1}$; Premolars, $\frac{2-2}{3-3}$; Molars, $\frac{3-3}{3-3}=32$.

Pelage.—ADULTS: Sexes identical, no noticeable seasonal variation. Above, grayish-brown; below lighter; base of fur white; membranes light-brown; pelage soft. YOUNG: Color and markings similar to adults.

Measurements.— Total length, 3.7 inches; tail vertebrae, 1.6 inches; ear from crown, 1.1 inches; hind foot, .4 inch; expanse of wing, 13 inches.

Range.—Arid region of southwestern United States.

Food.— Insects.

Remarks.— This Bat is the sole North American representative of the family of so-called Leaf-nosed Bats, the members of which are characterized by the possession of a more or less modified cutaneous nose-leaf. Other members of this group range south of the United States.

The California Large-eared, or Leaf-nosed Bat is the only member of this family of Bats found habitually north of the Rio Grande. There are other members of this peculiarly-marked group found in the topics. It seems to prefer hot or arid lands, for its home in North America is the desert region in the southwest.

The distinguishing mark on the end of the nose can be readily recognized. It seems to be made up of thin leaves of naked skin. These appendages have various shapes, as of a wedge, spear, or heart. Sometimes they are comparatively small, and sometimes they are so large that they form a kind of mask. In one instance, that of De Blainville's Bat, a West Indian species, the chin also has a convoluted extension of skin, giving the animal a weird and uncanny expression, not unlike a huge rosette or double-flower; hence it is termed a "Flower-nosed Bat."

There seems now to be little doubt that these nose-leaves are in some way connected with that "sixth sense" the possession of which by certain Bats has been often demonstrated, and which enables them to avoid all obstructions when flying in total darkness, and even when their eyes have been sealed.

The California Large-eared Bat has one of the simplest forms of nose-leaf, with defined lower border. It is a medium-sized Bat with large ears which are united above and between the eyes by a membrane. The lower lip is grooved, and there is a small wart on each side of the groove.

"I once kept a Large-eared Bat as a pet," says one observer, "and a most interesting little creature he was. One of his wings had been injured by the person who caught him, so that he could not fly, and was obliged to live on the floor of his cage. Yet, although he could take no exercise, he used to eat no less than seventy large bluebottle flies every evening. As long as the daylight lasted, he would take no notice of the flies at all. They might crawl about all over him, but still he would never move. But soon after sunset, when the flies began to get sleepy, the Bat would wake up. Fixing his eyes on the nearest fly, he would begin to creep toward it so slowly that it was almost impossible to see that he was moving. By degrees he would get within a few inches. Then, quite suddenly, he would leap upon it, and cover it with his wings, pressing them down on either side of his body so as to form a kind of a tent. Next he would tuck down his head, catch the fly in his mouth, and crunch it up. Then he would creep on toward another victim, always leaving the legs and the wings behind him, which in some strange way he had managed to strip off, just as we strip the legs from shrimps.

"I often watched him, too, when he was drinking. As he was so crippled, I used to pour a few drops of water on the floor of his cage, and when he felt thirsty he would scoop up a little in his lower jaw, and then throw his head back in order to let it run down his throat. But in a state of freedom Bats drink by just dipping the lower jaw into the water as they skim along close to the surface of a pond or a stream, and you may often see them doing so on a warm summer's evening. They get both food and drink on the run."

Photograph by Dr. R. W. Shufeldt

BROWN BAT ASLEEP

These Bats sleep head downward, hanging by their feet and " hooks "

GLOSSARY

(For the scientific names of the orders, suborders, and families of mammals, consult the Index.)

Abdominal. Relating to the abdomen or belly.

Abnormal. Irregular; not conforming to the type.

Alpine. Pertaining to high altitudes, chiefly near timber line.

Annulated. Surrounded by rings of color.

Aquatic. Pertaining to or living in the water.

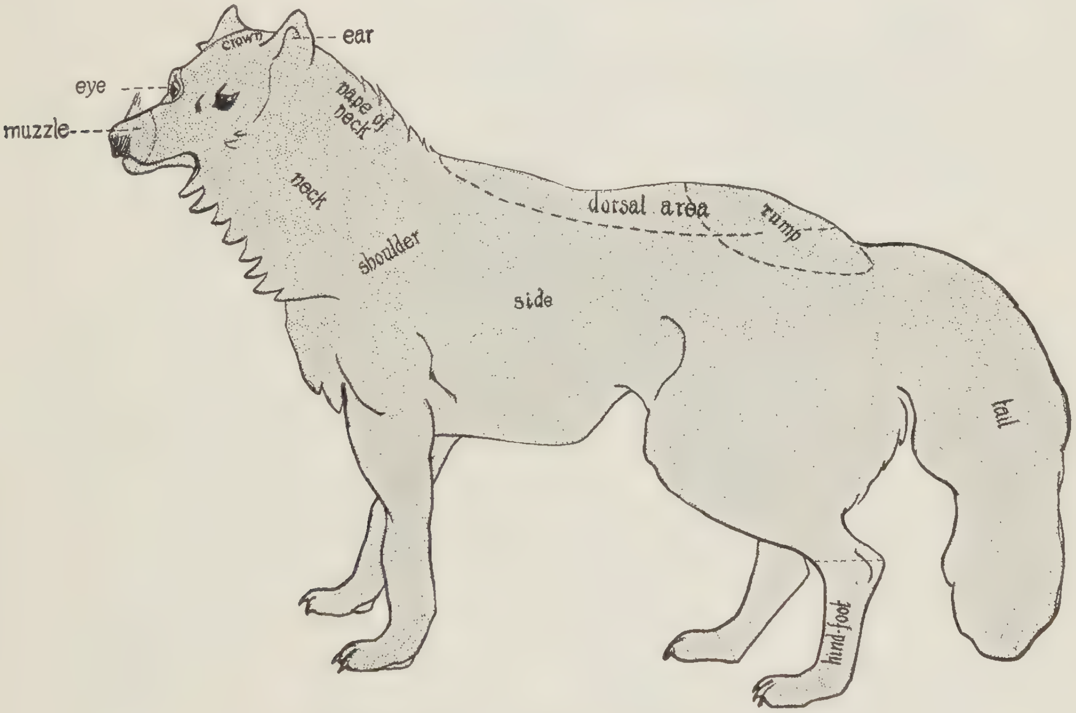
Arboreal. Pertaining to or living in trees.

Bicolor. Of two colors.

Boreal. Northern; used by scientists to designate a division of the earth comprised of its northern and mountainous parts.

Canine. The conical tooth next to the incisors. It is wanting in rodents.

Carnassial tooth. One of the last pair of premolar teeth in the upper jaw; one of the first pair of true molars in the lower jaw.



ANATOMICAL DIAGRAM OF THE WOLF

Carnivore. A flesh-eating animal, particularly one of the order Carnivora.

Carnivorous. Flesh-eating; feeding or preying on other animals.

Clavicle. The collar bone.

Comatose. Drowsy; denoting a state of profound sleep from which it is difficult to awaken one.

Crepuscular. Active at twilight.

Crustacean. One of the Crustacea, a class of animals including the crabs, lobsters, barnacles, etc.

Deciduous. Shed at certain periods or seasons.

Dental. Relating to the teeth. Dental formula is a method for showing the number and kind of teeth. The numbers in each jaw are written like fractions; those above the line representing the teeth in the upper jaw, and those below the line the teeth in the lower jaw. The number of teeth on each side of the jaw is shown by means of a dash separating the figures. The dental formula of the ocelot, for instance, is given thus:

Incisors, $\frac{3-3}{3-3}$; canines, $\frac{1-1}{1-1}$; premolars, $\frac{3-3}{2-2}$; molars, $\frac{1-1}{1-1}$; total, 30.

Dichromatic. Having two phases of color, independently of age, sex, or season.

Digitigrade. Walking upon the toes (as all birds and most mammals).

Diurnal. Active in the daytime.

Dorsal. Situated on or near the back; pertaining to the back.

Elongate. Used in the sense of lengthened or extended; elongated.

Embryo. Unhatched or unborn young in the early stages of development.

Environment. The external conditions and influences affecting the life and development of an animal.

Erectile. Capable of being erected or dilated.

Exotic. Foreign; not native; introduced from a foreign country.

Family. A group of genera agreeing in certain characters, and differing in one or more characters from other families of the order to which they belong.

Fauna. The animal life of a region.

Ferruginous. Like iron rust in color; yellowish red; brownish red.

Fetus. Unborn young in the later stages. Spelled also fœtus.

Fissiped. Cloven-footed; having the toes separated to the base.

Fossorial. Inhabiting burrows; adapted for digging or burrowing.

Frugivorous. Feeding on fruit.

Fulvous. Tawny; dull yellowish with a mixture of brown and gray.

Genus [plural, **genera**]. A group of species agreeing in certain characters, and differing from other genera of the family to which they belong; also a single species showing unusual differences.

Graminivorous. Feeding on grass and similar food.

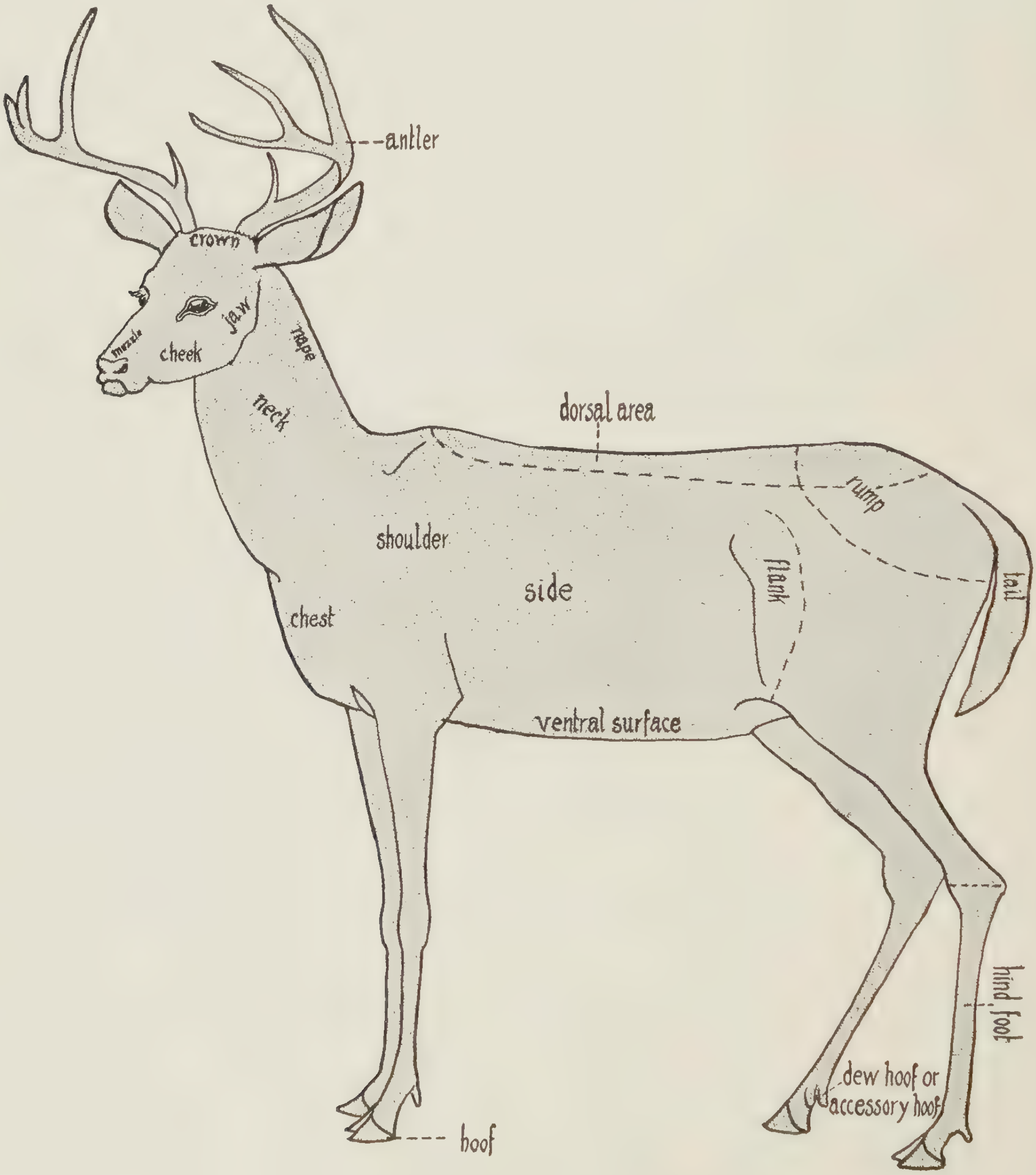
Granivorous. Feeding on grain or seeds.

Gregarious. Living or going in flocks or herds.

Habitat. Natural abode of an animal; the kind of environment in which an animal occurs.

Herbivorous. Living on or eating plants.

Heterogeneous. Of unlike qualities; differing in kind.



ANATOMICAL DIAGRAM OF THE ELK

Hibernate. To pass the winter in a lethargic or torpid state.

Homogeneous. Of like nature or kind.

Humerus. The bone of the upper part of the fore limb, from shoulder to elbow.

Hybrid. Offspring of parents of different species. Resulting from the union of two races or species.

Incisor. A cutting tooth in front of the canines, or a corresponding tooth of the lower jaw.

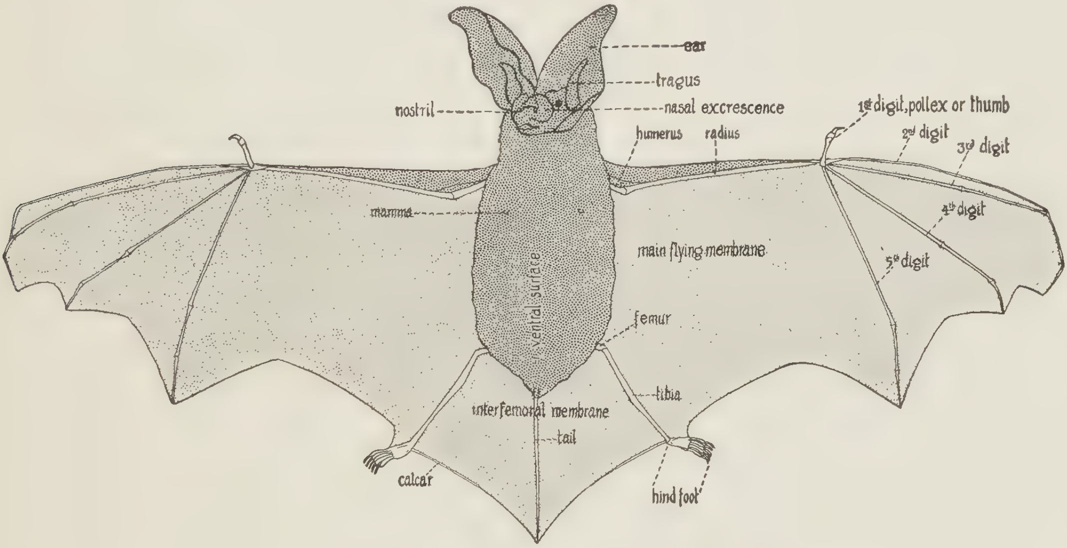
Indigenous. Growing or living naturally in a country or region; native; not imported.

Insectivorous. Feeding on insects; of or pertaining to insects.

Interfemoral. Between the thighs. In bats the interfemoral membrane is the membrane connecting the hind legs.

Littoral. Pertaining to or inhabiting the shore. A coastal region.

Longitudinal. Placed or running lengthwise.



ANATOMICAL DIAGRAM OF THE BAT

Maculate. Spotted; blotched.

Mamma [plural, **mammæ**]. A glandular organ in which the milk is secreted. It is present in all mammals, but in males is usually rudimentary. This word is sometimes loosely used for teat.

Mammal. An animal the female of which suckles her young.

Marine. Pertaining to, existing in, or formed by the sea.

Maritime. Living or found near the sea; bordering on the sea.

Marsupial. Having a pouch in which the young are carried. One of the order Marsupialia.

Metatarsal. Pertaining to the metatarsus or the part of the foot between the ankle and the toes.

Migratory. Moving, either occasionally or regularly, from one climate or region to another.

Molar. Grinding. A molar tooth, one of the cheek teeth behind the incisors and canines.

Mollusks. Shellfish such as clams, oysters, whelks, etc.

Monogamous. Mating with only one of the opposite sex. Compare polygamous.

Nocturnal. Moving about at night; done or occurring in the night.

Nonretractile. Not capable of being drawn in or back.

Occiput. The back part of the head.

Ochraceous. Of the color of ocher; resembling ocher.

Olivaceous. Olive-colored; of an olive-green color; resembling the olive.

Omnivorous. Eating both vegetable and animal food.

Order. A group of families agreeing in certain characters.

Palmated. Handshaped; like a hand with its fingers spread. In birds, having the forward toes webbed.

Pelage. A coat or covering, as of hair, fur, or wool.

Pelagic. Oceanic; living at the surface of the sea far from the coast.

Pendulous. Hanging downward; suspended loosely; swinging.

Phylum. A subkingdom or branch of the animal kingdom.

Piscivorous. Feeding on fish.

Plantigrade. Walking on the full length of the foot, as man and the bears. A plantigrade animal.

Polygamous. Having more than one mate at one time. Compare monogamous.

Prehensile. Adapted for seizing or grasping, as a monkey's tail.

Premolar. Preceding or in front of the true molar teeth. A premolar tooth.

Radial. In the region of or pertaining to the radius.

Radius. The front one of the two bones of the forearm.

Retractile. Capable of being drawn in or back, as a cat's claws.

Rodent. An animal of the order Rodentia, which includes the rats, squirrels, beavers, etc. Their incisor teeth are specially adapted for gnawing.

Rostrum. Snout, beak, or proboscis.

Rufous. Brownish red; rust-colored.

Ruminant. Chewing the cud. A cud-chewing animal.

Species. A group of animals possessing in common certain characters which distinguish them from other similar groups; a distinct sort or kind of animal.

Subspecies. A variety or race; a form connected with other forms of a species by individuals possessing intermediate characters.

Subterranean. Under the surface of the earth.

Tarsus. The ankle; the bones between the toes and the heel; the shank of a bird's leg.

Taxidermist. One who prepares, stuffs, and mounts in lifelike form the skins of animals.

Terrestrial. Inhabiting or belonging to the ground or land in distinction from water, trees, etc.

Tibia. The larger bone between the knee and the ankle.

Tine. A prong of an antler.

Tuberculated. Having tubercles, that is, small knoblike prominences on some part of an animal.

Type. Typical form. A type species is that form used as the basis of the original description of a species. A type genus is that genus from which the name of the family or subfamily to which it belongs is formed.

Ulna. The inner or back one of the two bones of the forearm.

Ungulate. A hoofed quadruped.

Vertebra [plural, **vertebræ**]. One of the segments of the backbone or spinal column.

Vertebrate. Having a spinal column or backbone. One of the large division of animals called the Vertebrata.

Vinaceous. Wine-colored, especially of the color of red wine.

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PART II

Animals of Other Lands

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PREFACE

THE concluding sections of this book, dealing with animals of other lands, are not entirely new, but are revised reprints of an earlier successful work, "The Living Animals of the World." The chief change made in this text has been to eliminate, so far as possible, references to American birds and mammals. Some cutting down in other directions was also necessary, with the result that the cream of five large volumes is here given in one volume, and none of the matter duplicates what has gone before.

The publishers feel justified in retaining this material from the fact that it has been widely sold and commended in its former shape. It contains what is believed to be the finest portrait gallery of wild animals ever collected in the covers of one work. From every page they greet the reader, life and action showing in each pose. The materials, in respect to both pictures and text, have been gathered from the whole world, and represent the latest studies, much of which has never been popularly published heretofore. Specialists of distinction and renowned scientific travelers have contributed photographs and field-notes, often from remote regions where alone many of the most rare and interesting animals may be found. These unique contributions come from the most distant islands of the Southern Ocean, the deserts and coral reefs of Australia, the New Zealand hills, the Indian jungle, the African forest and veldt, and the wilds of tropical and South America. Wherever it has not been possible to get really good pictures of wild creatures in their native haunts, living examples have been sought in the great Zoological Gardens of the world — London, Berlin, Antwerp, Florence, New York, Calcutta, and Sydney.

It is one of the most important functions of out-door photography, to-day, to preserve for posterity a record of passing conditions and of diminishing species; and a work like the present is of permanent interest, and will increase in historical and bibliographical value as time goes on. Such a book, covering in an entertaining style the whole range of zoology, carefully prepared by men of exact knowledge, yet avoiding technicalities, and wholly illustrated by precise reproductions of photographs, many in life colors, is not only novel and beautiful but is also of high value as an educator; and it would seem to be as indispensable a part of the library of every family and school-room as is the dictionary or yearbook, since by its aid all reading may be illuminated, and perchance corrected, and the whole view of nature enlightened and enlarged.

The editors have had the assistance of the most eminent authorities in other lands. Mr. F. C. Selous deals with the African Lion and the Elephants, with which he has had thrilling experiences; and other sportsmen treat of other game animals of the Dark Continent. To Mr. W. Saville-Kent, author of "The Great Barrier Reef," has been assigned the Marsupials of Australia, and also the Reptiles generally. Sir Herbert E. Maxwell writes on the Salmon family, and so on; while Dr. Richard Lydekker, Dr. R. Bower Sharpe, Mr. F. W. Kirby, and other specialists are editorial advisers in regard to the branches in which they stand as authorities

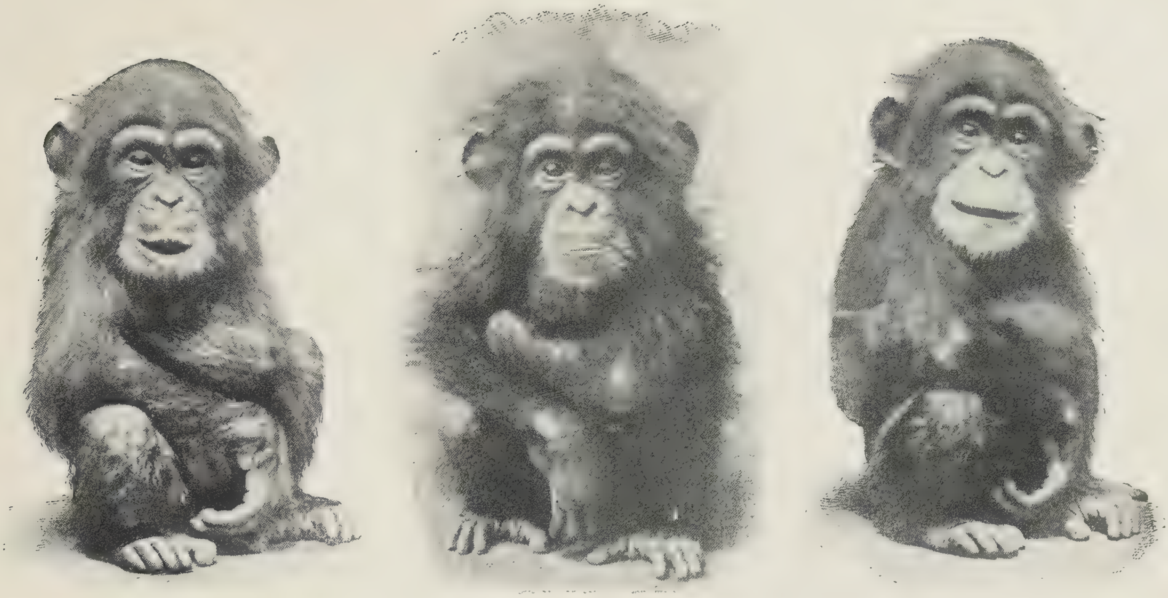


Photo by G. W. Wilson & Co., Ltd.] [Aberdeen

A YOUNG CHIMPANZEE

Anger *Pleasure* *Fear*

Mammals of Other Lands

CHAPTER I

APES, MONKEYS, AND LEMURS

THE MAN-LIKE APES

The Chimpanzee

Photo by Fratelli Alinari, Florence
ARABIAN BABOON

Of all the great apes the Chimpanzee most closely approaches man in bodily structure and appearance although in height it is less near the human standard than the gorilla, 5 feet being probably that of an adult male.

Several races of this ape are known, among them the True Chimpanzee and the Bald Chimpanzee. The varieties also include the Kulo-kamba, described by Du Chaillu, and the Soko, discovered by Livingstone, who confounded it with the gorilla. But the variations in neither of these are sufficiently important to justify their being ranked as species.

The first authentic mention of the chimpanzee is found in "The Strange Adventures of Andrew Battell," an English sailor taken prisoner by the Portuguese in 1590, who lived eighteen years near Angola. He speaks of two apes, the Pongo and the Enjocko, of which the former is the gorilla, the latter the chimpanzee. The animal was first seen in Europe in 1641, and described scientifically fifty-eight years later, but we are indebted to Dr. Savage, a missionary, for our first account of its habits, in 1847.

The chimpanzee, like the gorilla, is found only in Africa. The range includes West and Central Equatorial Africa, from the Gambia in the north to near Angola in the south, while it occurs in the Niam-Niam country to the northwest of the great lakes, and has been discovered recently in Uganda. The new Uganda Railway, which will open out the great lakes to the east, will bring many travelers well within reach of the nearest haunt of these great apes. It is on the likeness and difference of their form and shape to those of man that the attention of the world has been mainly fixed.

The chimpanzee is a heavily built animal, with chest and arms of great power. The male is slightly taller than the female. The crown is depressed, the chin receding, the ridges which overhang the eye-sockets more prominent than in man, less so than in the gorilla. The nose has a short bridge, and a flat extremity. The ear is large, and less human than that of the gorilla. The hands and feet are comparatively long; the digits are, except the thumb and great toe, joined by a web. The arms are short for an ape, reaching only to the knees. The teeth are similar to those of man, and the canines of only moderate size. The chimpanzee has thirteen pairs of ribs, and, like man, has a suggestion at the end of the vertebræ of a rudimentary tail. It walks on all-fours, with the backs of its closed fingers on the ground, and can only stand upright by clasping its hands above its head. The skin is of a reddish or brown flesh-colour, the hair black with white patches on the lower part of the face. The bald chimpanzee has the top, front, and sides of the face bare, exceedingly large ears, thick lips, and black or brown hands and feet.

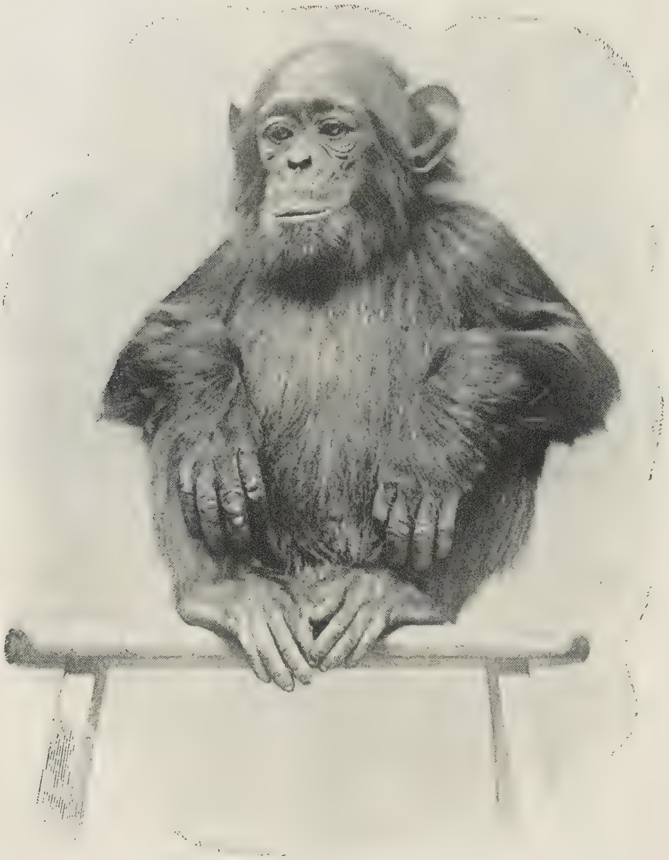


Photo by Scholastic Photo. Co.] [*Parson's Green*

"JENNY," THE WELL-KNOWN CHIMPANZEE

A VERY CHARACTERISTIC POSE

In this picture the rounded ear, human-like wrinkles on the forehead, and length of the toes should be noted

The chimpanzee's natural home is the thick forest, where tropical vegetation ensures almost total gloom. But near Loango it frequents the mountains near the coast. It is a fruit-feeding animal, said to do much damage to plantations, but the bald race, at all events in captivity, takes readily to flesh, and the famous "Sally" which lived in the Zoo for over six years used to kill and eat pigeons, and caught and killed rats. The male chimpanzee builds a nest in a tree for his family, and sleeps under its shelter; when food becomes scarce in the vicinity, a move is made, and a new nest built. This ape lives either in separate families or communities not exceeding ten in number, and is monogamous.

As to the animal's courage, it is difficult to get accurate information, as the sins of the gorilla and baboon have often been laid on its shoulders, and information derived from natives is usually untrustworthy. Apparently the chimpanzee avoids coming into collision with man, although, when attacked, it is a formidable antagonist. Tales of chimpanzees kidnapping women and children need stronger evidence than they have yet obtained. The natives kill this ape by spearing it in the back, or by driving it into nets, where it is entangled and easily dispatched. According to Livingstone, the Soko, as the chimpanzee is called in East Central Africa, kills the leopard by biting its paws, but falls an easy prey to the lion.

In captivity it is docile and intelligent, but usually fails to stand a northern climate for more than a few months. It is easily taught to wear clothes, to eat and drink in civilised fashion, to understand what is said to it, and reply with a limited vocabulary of grunts. Sally learnt to count perfectly up to six, and less perfectly to ten; she could also distinguish white from any colour, but if other colours were presented her she failed, apparently from colour-blindness. Of this ape the late Dr. G. J. Romanes wrote with something more than the enthusiasm of a clever man pursuing a favourite theme: "Her intelligence was conspicuously displayed by the remarkable degree in which she was able to understand the meaning of spoken language—a degree fully equal to that presented by an infant a few months before emerging from infancy, and therefore higher than that which is presented by any brute, so far at least as I have evidence to show." Romanes here speaks *only*, be it noticed, of ability to understand human speech—not to think and act But this is in itself a great mark of intelligence *on human lines.* "Having enlisted the cooperation of the keepers, I requested them to ask the ape repeatedly for one straw, two straws, three straws. These she was to pick up and hand out from among the litter of her cage. No constant order was to be observed in making these requests; but whenever she handed a number not asked for her offer was to be refused, while if she gave the proper number her offer was to be accepted, and she was to receive a piece of fruit in payment. In this way the ape had learnt to associate these three numbers with the names. As soon as the animal understood what was required, she never failed to give the number of straws asked for. Her education was then completed in a similar manner from three to four, and from four to five straws. Sally rarely made mistakes up to that number; but above five, and up to ten, to which one of the keepers endeavoured to advance her education, the result is uncertain. It is

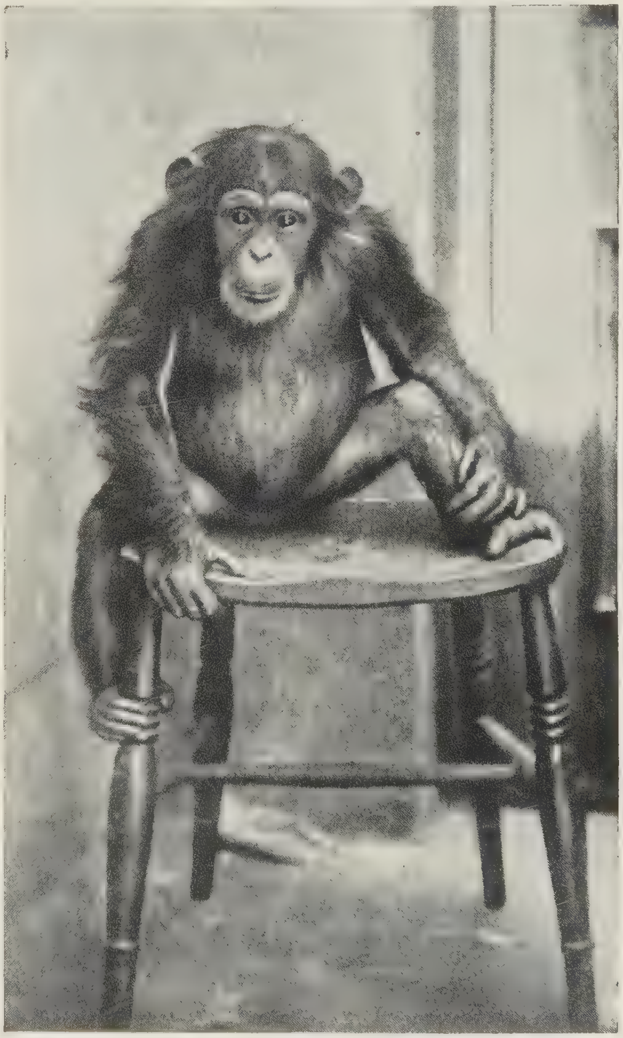


Photo by G. W. Wilson & Co., Ltd.]

A YOUNG CHIMPANZEE

This excellent photograph, by Major Nott, F.Z.S., is particularly good, as showing the manner in which these animals use their hands and feet evident that she understands the words seven, eight, nine, and ten to betoken numbers higher than those below them. When she was asked for any number above six, she always gave some number over six and under ten She sometimes doubled over a straw to make it present two ends, and was supposed (thus) to hasten the attainment of her task." By no means all the chimpanzees are so patient as Sally. One kept in the Zoological Gardens for some time made an incessant noise by stamping on the back of the box in which it was confined. It struck this with the flat of its foot while hanging to the cross-bar or perch, and made a prodigious din. This seems to bear out the stories of chimpanzees assembling and drumming on logs in the Central African forests.

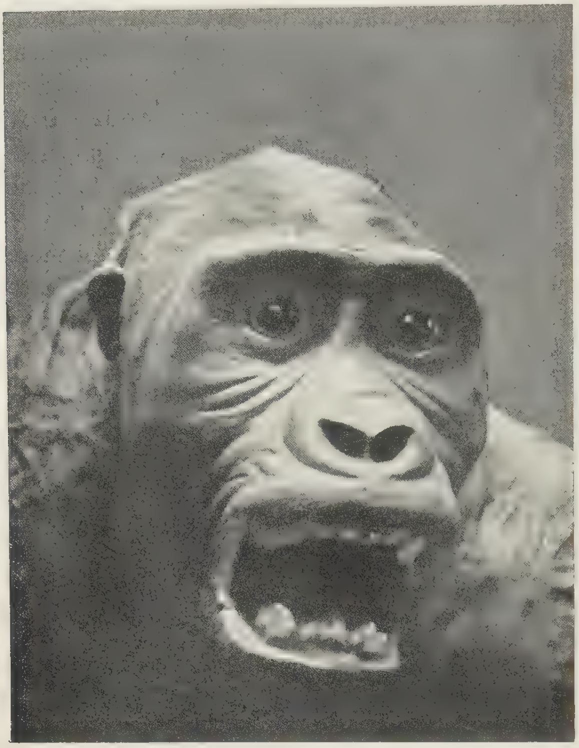


Photo by A. S. Rudland & Sons

HEAD OF MALE GORILLA

This is a photograph of one of the first gorillas ever brought to England. It was sent by the famous M. du Chaillu

The Gorilla

The name of this enormous ape has been known since 450 B. C. Hanno the Carthaginian, when off Sierra Leone, met with wild men and women whom the interpreter called GORILLAS. The males escaped and flung stones from the rocks, but several females were captured. These animals could not have been gorillas, but were probably baboons. Andrew Battell, already mentioned, described the gorilla under the name of Pongo. He says it is like a man, but without understanding even to put a log on a fire; it kills Negroes, and drives off the elephant with clubs; it is never taken alive, but its young are killed with poisoned arrows; it covers its dead with boughs. Dr. Savage described it in 1847. Later Du Chaillu visited its haunts, and his well-known book relates how he met and killed several specimens. But Mr. Winwood Reade, who also went in quest of it, declared that Du Chaillu, like himself, never saw a live gorilla. Von Koppenfels, however, saw a family of four feeding, besides shooting others. The late Miss Kingsley met several, one of which was killed by her elephant-men.

The gorilla has a limited range, extending from 2° north to 5° south latitude in West Africa, a moist overgrown region including the mouth of the Gaboon River. How far east it is found is uncertain, but it is known in the Sierra del Cristal. In 1851–52 it was seen in considerable numbers on the coast.

The Gorilla is the largest, strongest, and most formidable of the Primates. An adult male is from 5 feet 8 inches to 6 feet high, heavily built, with arms and chest of extraordinary power. The arms reach to the middle of the legs. The hands are clumsy, the thumb short, and the fingers joined by a web. The neck scarcely exists. The leg has a slight calf. The toes are stumpy and thick; the great toe moves like a thumb. The head is large and receding, with enormous ridges above the eyes, which give it a diabolical appearance. The canine teeth are developed into huge tusks. The nose has a long bridge, and the nostrils look downwards. The ear is small and man-like.

In colour the gorilla varies from deep black to iron-gray, with a reddish tinge on the head; old animals become grizzled. The outer hair is ringed gray and brown; beneath it is a woolly growth. The female is smaller—not exceeding 4 feet 6 inches—and less hideous, as the canines are much smaller, and the ridges above the eyes are not noticeable, a feature common also to the young.

Timid, superstitious natives and credulous or untrustworthy travelers have left still wrapped in mystery many of the habits of this mighty ape, whose fever-stricken, forest-clad haunts render investigation always difficult, often impossible. Many tales of its ferocity and strength are obviously untrue, but we think that too much has been disbelieved. That a huge arm descends from a tree, draws up and chokes the wayfarer, must be false, for intelligent natives have confessed to knowing no instance of the gorilla attacking man. That it vanquishes the leopard is probable; that it has driven the lion from its haunts requires proof. Nor can we accept tales of the carrying off of Negro women; and the defeat of the elephants, too, must be considered a fiction.

But we must believe that this ape, if provoked or wounded, is a terrible foe, capable of ripping open a man with one stroke of its paw, or of cracking the skull of a hunter as easily as a squirrel cracks a nut. There is a tale of a tribe that kept an enormous gorilla as executioner, which tore its victims to pieces, until an Englishman, doomed to meet it, noticing a large swelling near its ribs, killed it with a heavy blow or two on the weak spot.

Gorillas live mainly in the trees on whose fruit they subsist; they construct a shelter in the lower boughs for the family, and as a lying-in place for the female. The male is said to sleep below, with his back against the tree—a favourite attitude with both sexes—to keep off leopards On the ground it moves on all-fours, with a curious swinging action, caused by putting its hands with fingers extended on the ground, and bringing its body forward by a half-jump. Having a heel, it can stand better than other apes; but this attitude is not common, and Du Chaillu appears to have been mistaken when he describes the gorilla as attacking upright.

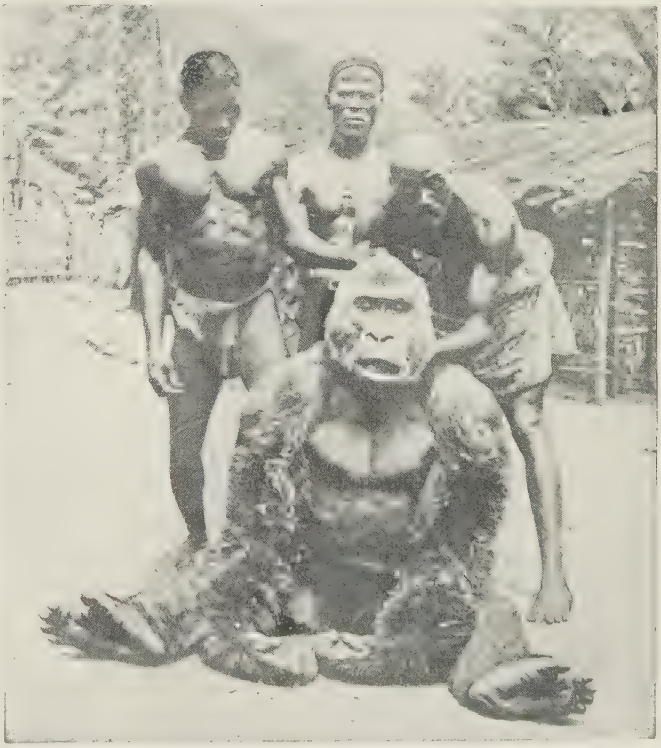
In captivity only immature specimens have been seen—Barnum's great ape being one of the larger forms of chimpanzee. Accounts vary as to the temper of the gorilla, some describing it as untamable, while others say it is docile and playful when young. There is a wonderful tale that a gorilla over 6 feet high was captured near Tanganyika, but nothing more has reached us about it.

When enraged, a gorilla beats its breast, as the writer was informed by a keeper, who thus confirmed Du Chaillu's account. Its usual voice is a grunt, which, when the animal is excited, becomes a roar.

THE ORANG-UTAN

This great red ape was mentioned by Linnæus in 1766, and at the beginning of the last century a specimen living in the Prince of Orange's collection was described by Vosmaer.

There are three varieties of the ORANG, called by the Dyaks MIAS-



By permission of Herr Omlauff] [*Hamburg*

A MALE GORILLA

This photograph of one of the largest gorillas known was taken immediately after death by Herr Paschen at Yaunde, and gives an excellent idea of the size of these animals as compared with Negroes. The animal weighed 400 lbs.

PAPPAN, MIAS-RAMBI, and MIAS-KASSU, the third of which is smaller, has no cheek-excrescences, and very large teeth. Some naturalists recognise a pale and a dark race.

Most of our information is due to Raja Brooke and Dr. Wallace. The species is confined to Borneo and Sumatra, but fossils have been found in India of this genus, as well as of a chimpanzee. The orang is less man-like than the chimpanzee and gorilla. In height the male varies from 3 feet 10 inches to 4 feet 6 inches, the female being a few inches shorter. It is a heavy creature, with large head—often a foot in breadth—thick neck, powerful arms, which reach nearly to the ankles, and protuberant abdomen. Its legs are short and bowed. The forehead is high, the nose fairly large, the ears very human. The throat is ornamented with large pouches, and there are often callosities on the cheeks. The fingers are webbed, the thumb small, the foot long and narrow, the great toe small and often without a nail. The brain is man like, and the ribs agree in number with those of man ; but there are nine bones in the wrist, whereas man, the gorilla, and the chimpanzee have but eight. The canine teeth are enormous in the male. The hair, a foot or more long on the shoulders and thighs, is yellowish red : there is a slight beard. The skin is gray or brown, and often, in adults, black.

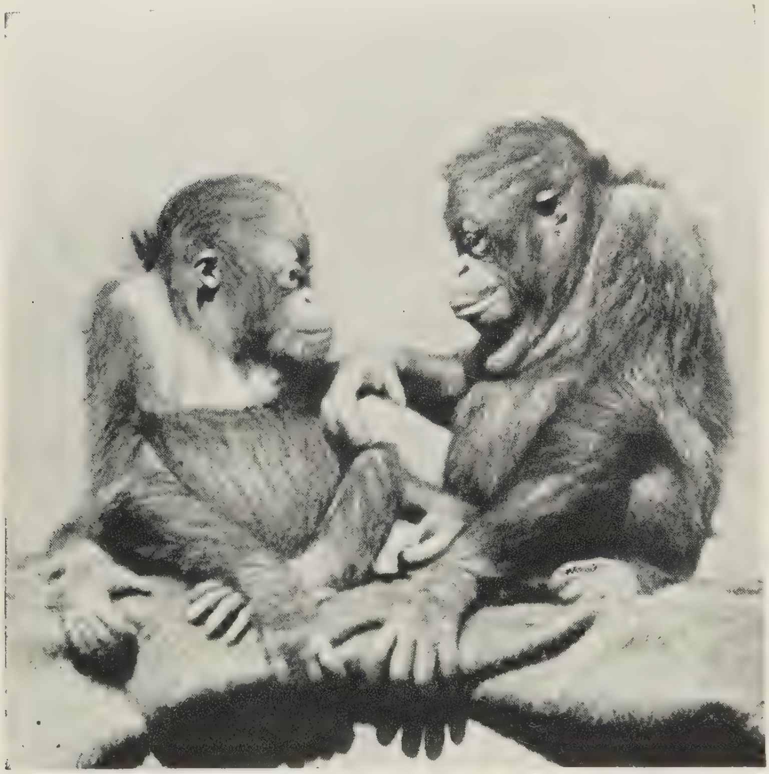


Photo by Ottomar Anschütz] [*Berlin*

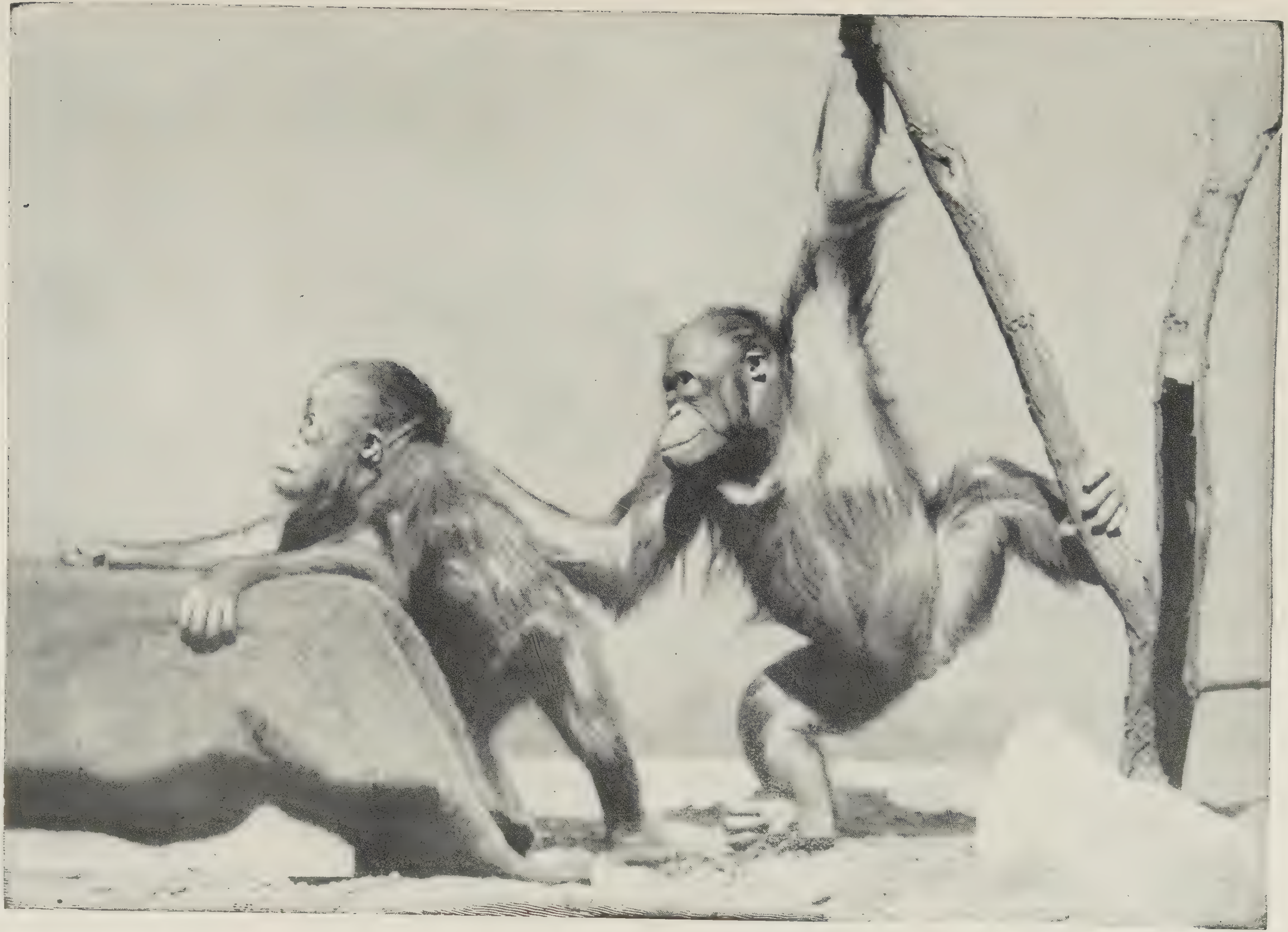
YOUNG ORANG-UTANS

It will be seen here, from the profile, that the young anthropoid ape has only the upper part of the head at all approaching the human type

The orang is entirely a tree-living animal, and is only found in moist districts where there is much virgin forest. On the ground it progresses clumsily on all-fours, using its arms as crutches, and with the side only of its feet on the ground. In trees it travels deliberately but with perfect ease, swinging along underneath the branches, although it also walks along them semi-erect. It lives alone with mate and young, and builds a sleeping place sufficiently low to avoid the wind. Its food is leaves and fruit, especially the durian ; its feeding-time, midday.

No animal molests the mias save—so say the Dyaks—the python and crocodile, both of which it kills by tearing with its hands. It never attacks man, but has been known to bite savagely when brought to bay, and it is very tenacious of life, one being found by Mr. Wallace still alive after a fall from a tree, when " both legs had been broken, its hip-joint and the root of the spine shattered, and two bullets flattened in neck and jaws."

In captivity young orangs are playful and docile, but passionate. Less intelligent than chimpanzees, they may be taught to eat and drink nicely, and to obey simple commands. One in the Zoo at present has acquired the rudiments of drill. They will eat meat and eggs, and drink wine, beer, spirits, and tea. An orang described years ago by Dr. Clarke Abel was allowed



BABY ORANG-UTANS AT PLAY

[Berlin

the run of the ship on the voyage to England, and would play with the sailors in the rigging. When refused food he pretended to commit suicide, and rushed over the side, only to be found under the chains.

The orang is the least interesting of the three great apes; he lacks the power and brutality of the gorilla and the intelligence of the chimpanzee. "The orang," said its keeper to the writer, "is a buffoon; the chimpanzee, a gentleman."

It is worth remark that, although all these apes soon die in menageries, in Calcutta, where they are kept in the open, orangs thrive well.

The Gibbons

Next after the great apes in man-like characters come a few long-armed, tailless apes, known as the Gibbons. Like the orang-utan, they live in the great tropical forests of Asia, especially the Indian Archipelago; like the latter, they are gentle, affectionate creatures; and they have also a natural affection for man. But it is in mind and temperament, rather than in skeleton, that the links and differences between men and monkeys must be sought. It will be found that these forest apes differ from other animals and from the true monkeys mainly in this—that they are predisposed to be friendly to man and to obey him, and that they have no bias towards mischief, or "monkey tricks." They are thoughtful, well behaved, and sedate.

Photo by Ottomar Anschütz] [*Berlin*

TWO BABY ORANG-UTANS. **THE TUG-OF-WAR**

The Siamang, one of the largest of the long-armed, tailless gibbons, lives in the Malay Archipelago. The arms of a specimen only 3 feet high measured 5 feet 6 inches across. This, like all the gibbons, makes its way from tree to tree mainly by swinging itself by its arms. But the siamang can *walk* upright and run. One kept on board ship would walk down the cabin breakfast-table without upsetting the china. The White-handed Gibbon is found in Tenasserim, southwest of Burma. This ape has a musical howl, which the whole flock utters in the early mornings on the tree-tops. In Northern India, in the hills beyond the Brahmaputra, lives another gibbon, the Hulock. One of these kept in captivity soon learnt to eat properly at meals, and to drink out of a cup, instead of dipping his fingers in the tea and milk and then sucking them. The Silvery Gibbon kept at the Zoological Gardens was a most amiable pet, and had all the agility of the other gibbons. It is very seldom seen in this country, being a native of Java, where it is said to show the most astonishing activity among the tall cane-groves. One of the first ever brought to England belonged to the great Lord Clive. The Agile Gibbon is another and darker ape of this group.

Photo by York & Son] *[Notting Hill*

WHITE-HANDED GIBBON

This gibbon is found in the forests of the Malay Archipelago

The list of the man-like ape closes with this group. All the gibbons are highly specialised for tree-climbing and an entirely arboreal life; but it is undeniable that, apart from the modifications necessary for this, such as the abnormal length of the arms, the skeleton closely resembles that of the human being. In their habits, when wild, none of these apes show any remarkable degree of intelligence; but their living is gained in so simple a way, by plucking fruits and leaves, that there is nothing in their surroundings to stimulate thought. They do not need even to think of a time of famine or winter, or to lay up a stock of food for such a season, because they live in the forests under the Equator.

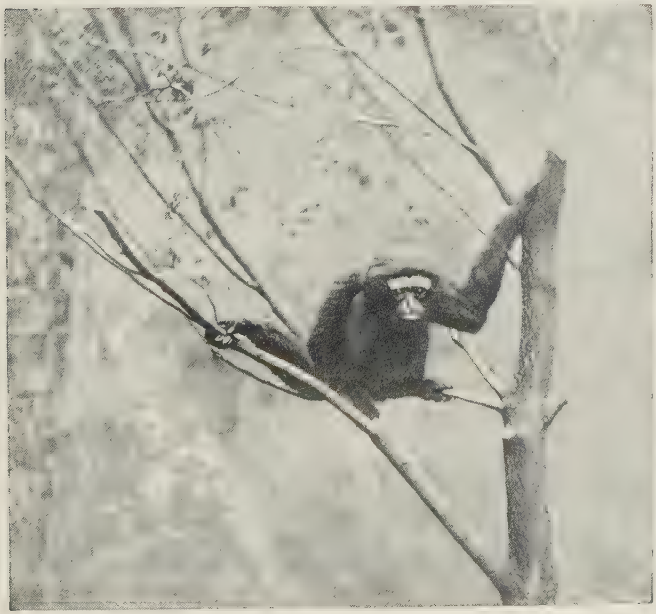


Photo by York & Son] *[Notting Hill*

HULOCK GIBBON

The great length of arm in comparison with the body and head should here be noted

MONKEYS

The Dog-shaped Monkeys

After the gibbons come a vast number of monkeys of every conceivable size, shape, and variety, which naturalists have arranged in consecutive order with fair success Until we reach the Baboons, and go on to the South American Monkeys and the Lemurs, it is not easy to give any idea of what these monkeys do or look like merely by referring to their scientific groups. The usual order of natural histories will here be followed, and the descriptions will, so far as possible, present the

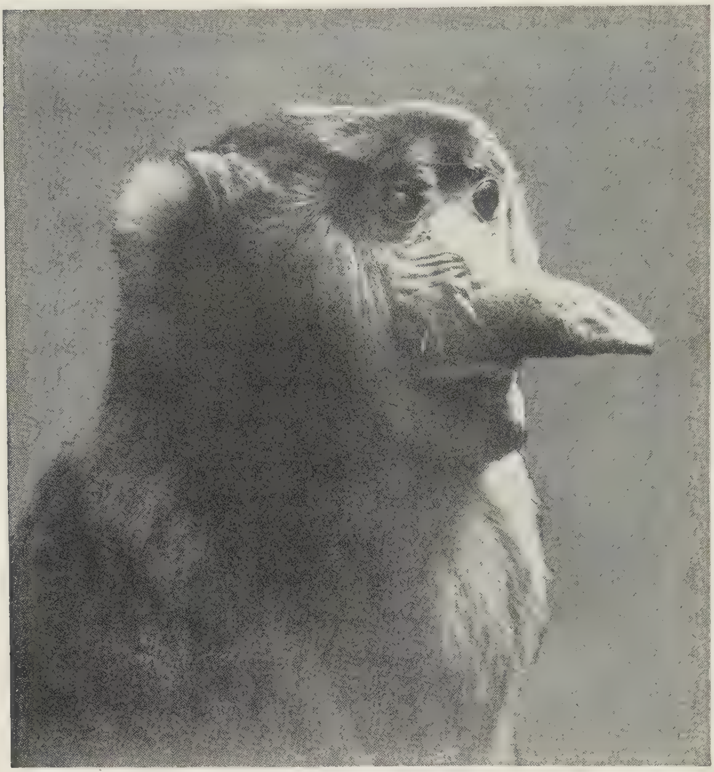


Photo. by A. S. Rudland & Sons

HEAD OF PROBOSCIS MONKEY

A native of Borneo. Next to the orang-utan, the most striking monkey in the Malay Archipelago

habits and appearance of the monkeys specially noticed.

This great family of true monkeys contains the Sacred Monkeys, or Langurs, of India, the Guerezas and Guenons of Africa, the Mangabeys, Macaques, and Baboons. Most of them have naked, hard patches of skin on the hindquarters, and the partition between the nostrils is narrow. Some have tails, some none, and they exhibit the most astonishing differences of size and shape. Perhaps the most grotesque and astonishing of them all is the PROBOSCIS MONKEY. It is allied to the langurs, and is a native of the island of Borneo, to which it is confined; its home is the west bank of the Sarawak River. It is an arboreal creature, living in small companies. Mr. Hose, who saw them in their native haunts says that the proboscis monkeys kept in the trees overhanging the river, and were most difficult to shoot. "I saw altogether about 150 of these monkeys, and without a single exception all were in trees over the water, either lake, river, or in submerged forest. As long as they are in sight, they are very conspicuous objects, choosing the most commanding positions on open tree-tops Once I saw thirteen in one tree, sitting lazily on the branches, as is their habit, sunning themselves, and enjoying the scenery." They are very striking animals in colour, as well as in form. The face is cinnamon-brown, the sides marked with reddish brown and white, the belly white, the back red-brown and dark brown. Next to the orang-utan, these are the most striking monkeys in the Malay Archipelago.

The greater number of the species intermediate between the gibbons and the New World species are called "DOG-SHAPED" MONKEYS. We wonder why? Only the baboon and a few others are in the least like dogs. The various SACRED MONKEYS of India are often seen in this country, and are quite representative of the "miscellaneous" monkeys in general. Most of them have cheek-pouches, a useful monkey-pocket. They poke food into their pouches, which unfold to be filled, or lie flat when not wanted; and with a pocketful of nuts or rice on either side of their faces, they can scream, eat, bite, or scold quite comfortably, which they could not do with their mouths full. The pouchless monkeys have only their big stomachs to rely on.

The ENTELLUS MONKEY is the most sacred of all in India. It is gray above and nutty brown below, long-legged and active, a thief and an impudent robber. In one of the Indian cities they became such a nuisance that the faithful determined to catch and send away some hundreds. This was done, and the holy monkeys were deported in covered carts, and released many miles off. But the monkeys were too clever. Having thoroughly enjoyed their ride, they all refused to part with the carts, and, hopping and grimacing, came leaping all the way back beside them to the city, grateful for their outing. One city obtained leave to kill the monkeys;

but the next city then sued them for "killing their deceased ancestors." In these monkey-infested cities, if one man wishes to spite another, he throws a few handfuls of rice on to the roof of his house about the rainy season. The monkeys come, find the rice, and quietly lift off many of the tiles and throw them away, seeking more rice in the interstices.

This is not the monkey commonly seen in the hills and at Simla. The large long-tailed monkey there is the HIMALAYAN LANGUR, one of the common animals of the hills. "The langur," says Mr. Lockwood Kipling in his "Beast and Man in India," "is, in his way, a king of the jungle, nor is he often met with in captivity. In some parts of India troops of langurs come bounding with a mighty air of interest and curiosity to look at passing trains, their long tails lifted like notes of interrogation; but frequently, when fairly perched on a wall or tree alongside, they seem to forget all about it, and avert their heads with an affectation of languid indifference."

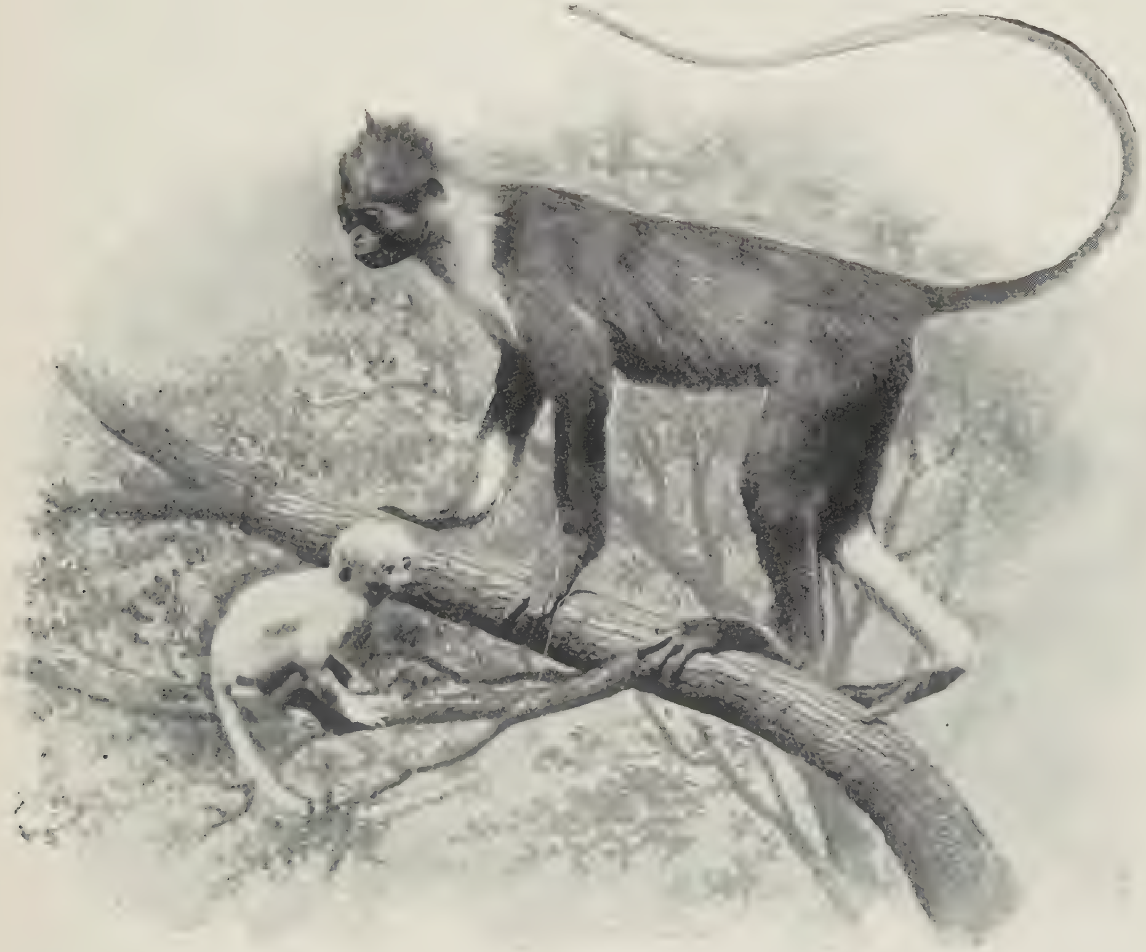


Photo by A. S. Rudland & Sons

CROSS-BEARING LANGUR AND YOUNG

A forest monkey of Borneo

In India no distinction is made between monkeys. It is an abominable act of sacrilege to kill one of any kind. In the streets holy bulls, calves, parrakeets, sparrows, and monkeys all rob the shops. One monkey-ridden municipality sent off its inconvenient but holy guests by rail, advising the station-master to let them loose at the place to which they were consigned. The station, Saharanpur, was a kind of Indian Chicago, and the monkeys got into the engine-sheds and workshops among the driving-wheels and bands. One got in the double roof of an inspection car, and thence stole mutton, corkscrews, camp-glasses, and dusters. Among many other interesting and correct monkey stories of Mr. Kipling's is the following: "The chief confectioner of Simla had prepared a most splendid bride-cake, which was safely put by in a locked room, that, like most back rooms in Simla, looked out on the mountainside. It is little use locking the door when the window is left open. When they came to fetch the bride-cake, the last piece of it was being handed out of the window by a chain of monkeys, who whitened the hillside with its fragments."

From India to Ceylon is no great way, yet in the latter island different monkeys are found. The two best known are the WHITE-BEARDED WANDEROO MONKEY and the GREAT WANDEROO. Both are grave, well-behaved monkeys. The former has white whiskers and a white beard, and looks so wise he is called in Latin *Nestor*, after the ancient counsellor of the Greeks. Nice, clean little monkeys are these, and pretty pets. The great wanderoo is rarer. It lives in the hills. "A flock of them," says Mr. Dallas, "will take possession of a palm-grove, and so well can they conceal themselves in the leaves that the whole party become invisible. The presence of a dog excites their irresistible curiosity, and in order to watch his movements they never fail to betray themselves. They may be seen congregated on the roof of a native hut. Some years ago the child of a European clergyman, having been left on the ground by a nurse, was bitten and teased to death by them. These monkeys have only one wife." Near relatives of the langurs are the two species of SNUB-NOSED MONKEYS, one of which (see figure on page 18) inhabits Eastern Tibet and Northwestern China, and the other the valley of the Mekong.

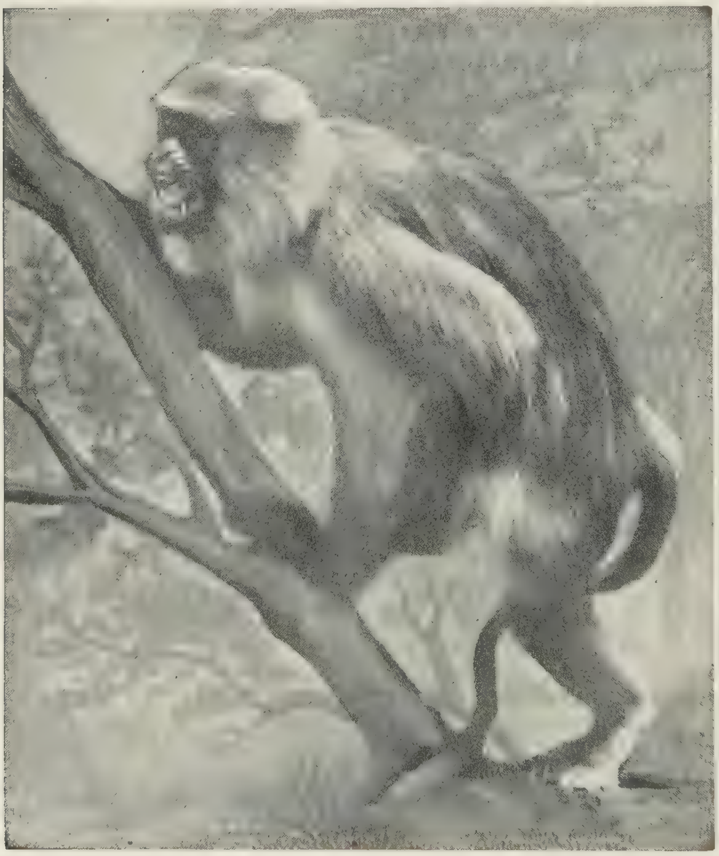


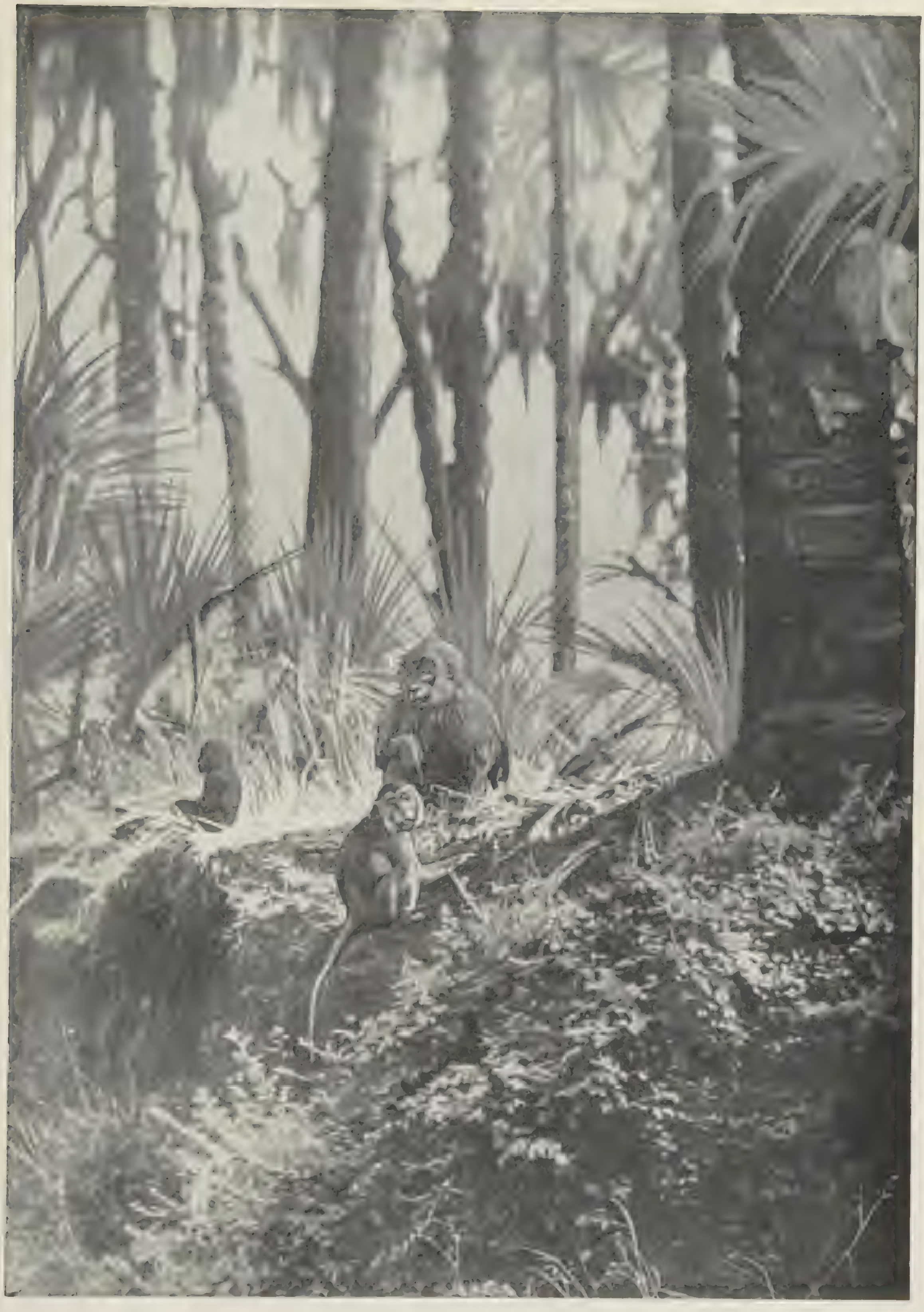
Photo by W. S. Rudland & Sons

MALE HIMALAYAN LANGUR

A king of the jungle, not often met with in captivity

THE GUEREZAS AND GUENONS

Among the ordinary monkeys of the Old World are some with very striking hair and colours. The GUEREZA of Abyssinia has bright white and black fur, with long white fringes on the sides. This is the black-and-white skin fastened by the Abyssinians to their shields, and, if we are not wrong, by the Kaffirs also. Among the GUENONS, a large tribe of monkeys living in the African forests, many of which find their way here as "organ monkeys," is the DIANA, a most beautiful creature, living on the Guinea Coast. It has a white crescent on its forehead, bluish-gray fur, a white beard, and a patch of brilliant chestnut on the back, the belly white and orange. A lady, Mrs. Bowditch, gives the following account of a Diana monkey on board ship. It jumped on to her shoulder, stared into her face, and then made friends, seated itself on her knees, and carefully examined her



GELADA BABOONS AT HOME

This photograph is probably unique, as a gelada baboon has been rarely seen. It shows them at home looking for food on the ground under the bamboos and palms. It was taken by Lord Delamere in the East African jungle

Photo by A. S. Rudland & Sons

MANTLED GUEREZA

This group of monkeys supplies the "monkey muffs" once very fashionable. The species with white plumes is used to decorate the Kaffir shields

hands. "He then tried to pull off my rings, when I gave him some biscuits, and making a bed for him with my handkerchief he then settled himself comfortably to sleep; and from that moment we were sworn allies. When mischievous, he was often banished to a hen-coop. Much more effect was produced by taking him in sight of the panther, who always seemed most willing to devour him. On these occasions I held him by the tail before the cage; but long before I reached it, knowing where he was going, he pretended to be dead. His eyes were closed quite fast, and every limb was as stiff as though there were no life in him. When taken away, he would open one eye a little, to see whereabouts he might be; but if he caught sight of the panther's cage it was instantly closed, and he became as stiff as before." This monkey stole the men's knives, tools, and handkerchiefs, and even their caps, which he threw into the sea. He would carefully feed the parrots, chewing up biscuit and presenting them the bits; and he caught another small monkey and painted it black! Altogether, he must have enlivened the voyage. The Grivet Monkey, the Green Monkey, the Mona Monkey, and the Mangabey are other commonly seen African species.

The Macaques

The Macaques, of which there are many kinds, from the Rock of Gibraltar to far Japan, occupy the catalogue between the guenon and the baboon. The Common Macaque and many others have tails. Those of Japan, and some of those of China, notably the Tcheli Monkey, kept outside the monkey-house at the Zoo, and the Japanese Macaque, at the other entrance, are tailless, and much more like anthropoid apes. The Tcheli monkey is large and powerful, but other macaques are of all sizes down to little creatures no bigger than a kitten. Some live in the hottest plains, others in the mountains. The Common Macaque, found in the Malay Archipelago, is a strong, medium-sized monkey. The Formosan Macaque is a rock-living creature; those of Japan inhabit the pine-groves, and are fond of pelting any one who passes with stones and fir-cones. The Bonnet Macaque is an amusing little beast, very fond of hugging and nursing others in captivity. The Bandar or Rhesus Monkey, a common species, also belongs to this group. But the most interesting to Europeans is the Magot, or Barbary Ape. It is the last monkey left in Europe. There it only lives on the Rock of Gibraltar. It was the monkey which Galen is said to have dissected, because he was not permitted to dissect a human body. These monkeys are carefully preserved upon the Rock. Formerly, when they were more com-

Photo by L. Medland, F.Z.S.] North Finchley

DIANA MONKEY

One of the most gaily coloured monkeys of Africa

THE BABOONS

Far the most interesting of the apes in the wild state are the BABOONS. Their dog-like heads (which in some are so large and hideous that they look like a cross between an ill-tempered dog and a pig), short bodies, enormously strong arms, and loud barking cry distinguish them from all other creatures. The greater number—for there are many kinds—live in the hot, dry, stony parts of Africa. They are familiar figures from the cliffs of Abyssinia to the Cape, where their bold and predatory bands still occupy Table Mountain. They are almost the only animals which the high-contracting Powers of Africa have resolved not to protect at any season, so mischievous are they to crops, and recently to the flocks. They kill the suckling lambs, and tear them to pieces for the sake of the milk contained in their bodies.

One of the best-known baboons is the CHACMA of South Africa. The old males grow to a great size, and are most formidable creatures. Naturally, they are very seldom caught; but one very large one is in the Zoological Gardens, Regent's Park, at the time of writing. The keeper declares he would rather go into a lion's cage than into the den of this beast when angry. Its head is nearly one-third of its total length from nose to the root of the tail. Its jaw-power is immense, and its forearm looks as strong as Sandow's.

mon, they were very mischievous. The following story was told by Mr. Bidcup: "The apes of the Rock, led by one particular monkey, were always stealing from the kit of a certain regiment encamped there. At last the soldiers caught the leader, shaved his head and face, and turned him loose. His friends, who had been watching, received him with a shower of sticks and stones. In these desperate circumstances the ape sneaked back to his old enemies, the soldiers, with whom he remained." Lord Heathfield, a former Governor of the Rock, would never let them be hurt; and on one occasion, when the Spaniards were attempting a surprise, the noise made by the apes gave notice of their attempt.

Photo by G. W. Wilson & Co., Ltd.] [Aberdeen

BARBARY APE

The last of the European monkeys on this side of the Mediterranean; and it is only found on the Rock of Gibraltar

Photo by C. Reid] [Wishaw, N. B.

RHESUS MONKEY

A young specimen of the common Bengal monkey

Like all monkeys, this creature has the power of springing instantaneously from a sitting position; and its bite would cripple anything from a man to a leopard. The chacmas live in companies in the kopjes, whence they descend to forage the mealie-grounds, river-beds, and bush. Thence they come down to steal fruit and pumpkins or corn, turn over the stones and catch beetles, or eat locusts. Their robbing expeditions are organised. Scouts keep a lookout, the females and young are put in the centre, and the retreat is protected by the old males. Children in the Cape Colony are always warned not to go out when the baboons are near. When irritated—and they are very touchy in their tempers—the whole of the males will sometimes charge and attack. The possibility of this is very unpleasant, and renders people cautious.

Not many years ago a well-known sportsman was shooting in Somaliland. On the other side of a rocky ravine was a troop of baboons of a species of which no examples were in the British Museum. Though he knew the danger, he was tempted to shoot and to secure a skin. At 200 yards he killed one dead, which the rest did not notice. Then he hit another and wounded it. The baboon screamed, and instantly the others sat up, saw the malefactor, and charged straight for him. Most fortunately, they had to scramble down the ravine and up again, by which time the sportsman and his servant had put such a distance between them, making "very good time over the flat," that the baboons contented themselves by barking defiance at them when they reached the level ground.

They are the only mammals which *thoroughly* understand combination for defense as well as attack. But Brehm, the German traveler, gives a charming story of genuine courage and self-sacrifice shown by one. His hunting dogs gave chase to a troop which was retreating to some cliffs, and cut off a very young one, which ran up on to a rock, only just out of reach of the dogs. An old male baboon saw this, and came along to the rescue. Slowly and deliberately he descended, crossed the open space, and stamping his hands on the ground, showing his teeth, and backed by the furious barks of the rest of the baboons, he disconcerted and cowed these savage dogs, climbed on to the rock, picked up the baby, and carried him back safely. If the dogs had attacked the old patriarch, his tribe would probably have helped him. Burchell, the naturalist after whom Burchell's zebra is named, let his dogs chase a troop. The baboons turned on them, killed one on the spot by biting through the great blood-vessels of the neck, and laid bare the ribs of

Photo by A. S. Rudland & Sons

RHESUS MONKEY AND SOOTY MANGABEY

The sooty mangabey (to the right of the picture) is gentle and companionable, but petulant and active

Photo by L. Medland, F.Z.S., North Finchley

GREY-CHEEKED MANGABEY

One of the small African monkeys

Photo by A. S. Rudland & Sons

CHINESE MACAQUE

This monkey lives in a climate as cold as ours

another. The Cape Dutch in the Old Colony would rather let their dogs bait a lion than a troop of baboons. The rescue of the infant chacma which Brehm saw himself is a remarkable, and indeed the most incontestable, instance of the exhibition of courage and self-sacrifice by a *male* animal.

If the baboons were not generally liable to become bad-tempered when they grow old, they could probably be trained to be among the most useful of animal helpers and servers; but they are so formidable, and so uncertain in temper, that they are almost too dangerous for attempts at semi-domestication. When experiments have been made, they have had remarkable results. Le Vaillant, one of the early explorers in South Africa, had a chacma baboon which was a better watch than any of his dogs. It gave warning of any creature approaching the camp at night long before the dogs could hear or smell it. He took it out with him when he was shooting, and used to let it collect edible roots for him. The latest example of a trained baboon only died a few years ago. It belonged to a railway signalman at Uitenhage station, about 200 miles up-country from Port Elizabeth, in Cape Colony. The man had the misfortune to undergo an operation in which both his feet were amputated, after being crushed by the wheels of a train. Being an ingenious fellow, he taught his baboon, which was a full-grown one, to pull him along the line on a trolley to the "distant" signal. There the baboon stopped at the word of command, and the man would work the lever himself. But in time he taught the baboon to do it, while he sat on the trolley, ready to help if any mistake were made.

Photo by York & Son, Notting Hill

GRIVET MONKEY

This is the small monkey commonly taken about with street-organs

Photo by A. S. Rudland & Sons

BONNET MONKEY, AND ARABIAN BABOON (ON THE RIGHT)

The chacmas have for relations a number of other baboons in the rocky parts of the African Continent, most of which have almost the same habits, and are not very different in appearance. Among them is the GELADA BABOON, a species very common in the rocky highlands of Abyssinia; another is the ANUBIS BABOON of the West Coast of Africa. The latter is numerous round the Portuguese settlement of Angola. Whether the so-called COMMON BABOON of

Photo by L. Medland, F.Z.S.] [North Finchley

RHESUS MONKEYS

This photograph is particularly interesting. It was actually taken by another monkey, which pressed the button of Mr. Medland's camera

the menageries is a separate species or only the young of some one of the above-mentioned is not very clear. But about another variety there can be no doubt. It has been separated from the rest since the days of the Pharaohs. It does not differ in habits from the other baboons, but inhabits the rocky parts of the Nile Valley. It appears in Egyptian mythology under the name of Thoth, and is constantly seen in the sculptures and hieroglyphs.

Equally strong and far more repulsive are the two baboons of West Africa—the Drill and the Mandrill. As young specimens of these beasts are the only ones at all easily caught, and these nearly always die when cutting their second teeth when in captivity, large adult mandrills are seldom seen in Europe. They grow to a great size, and are probably the most hideous of all beasts. The frightful nose, high cheek-bones, and pig-like eyes are the basis of the horrible heads of devils and goblins which Albert Dürer and other German or Dutch mediæval painters sometimes put on canvas. Add to the figure the misplaced bright colours—cobalt-blue on the cheeks, which are scarred, as if by a rake, with scarlet furrows, and scarlet on the buttocks—and it will be admitted that nature has invested this massive, powerful, and ferocious baboon with a repulsiveness equaling in completeness the extremes of grace and beauty manifested in the roe-deer or the bird of paradise.

The natives of Guinea and other parts of West Africa have consistent accounts that the mandrills have tried to carry off females and children. They live in troops like the chacmas, plunder the fields, and, like all baboons, spend much time on the ground walking on all-fours. When doing this, they are quite unlike any other creatures. They walk slowly, with the head bent downwards, like a person walking on hands and knees looking for a pin. With the right hand (usually) they turn over every stick and stone, looking for insects, scorpions, or snails, and these they seize and eat. The writer has seen

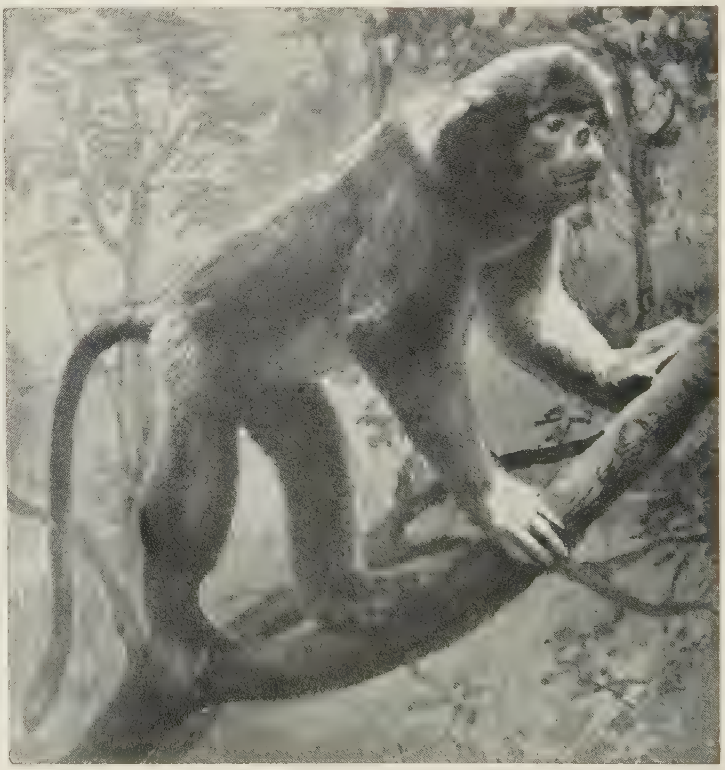


Photo by A. S. Rudland & Sons

ORANGE SNUB-NOSED MONKEY

This should be contrasted with the Proboscis Monkey baboons picking up sand, and straining it through their fingers, to see if there were ants in it. He has also seen one hold up sand in the palm of its hand, and blow the dust away with its breath, and then look again to see if anything edible were left. Mandrills kept in captivity until adult become very savage. One in Wombwell's menagerie killed another monkey and a beagle. Mr. Cross owned one which would sit in an armchair, smoke, and drink porter; but these convivial accomplishments were accompanied by a most ferocious temper.

One of the earliest accounts of the habits of the Abyssinian baboons was given by Ludolf in his "History of Ethiopia." It was translated into quaint, but excellent old English: "Of Apes," he says, "there are infinite flocks up and down in the mountains, a thousand and more together, and they leave no stone unturned. If they meet with one that two or three cannot lift they call for more aid, and all for the sake of the Worms that lye under, a sort of dyet which they relish exceedingly. They are very greedy after Emmets. So that having found an emmet hill, they presently surround it, and laying their fore paws with the hollow downward upon the ant heap, as soon as the Emmets creep into their treacherous palms they lick 'em off, with great comfort to their stomachs. And there they will lye till there is not an Emmet left. They are also pernicious to fruits and apples, and will destroy whole fields and gardens unless they be looked after. For they are very cunning, and will never venture in till the return of their spies, which they send always before, who, giving all information that it is safe, in they rush with their whole body and make a quick despatch. Therefore they go very quiet and silent to their prey; and if their young ones chance to make a noise, they chastise them with their fists; but if the coast is clear, then every one has a different noise to express his joy." Ludolf clearly means the baboons by this description.

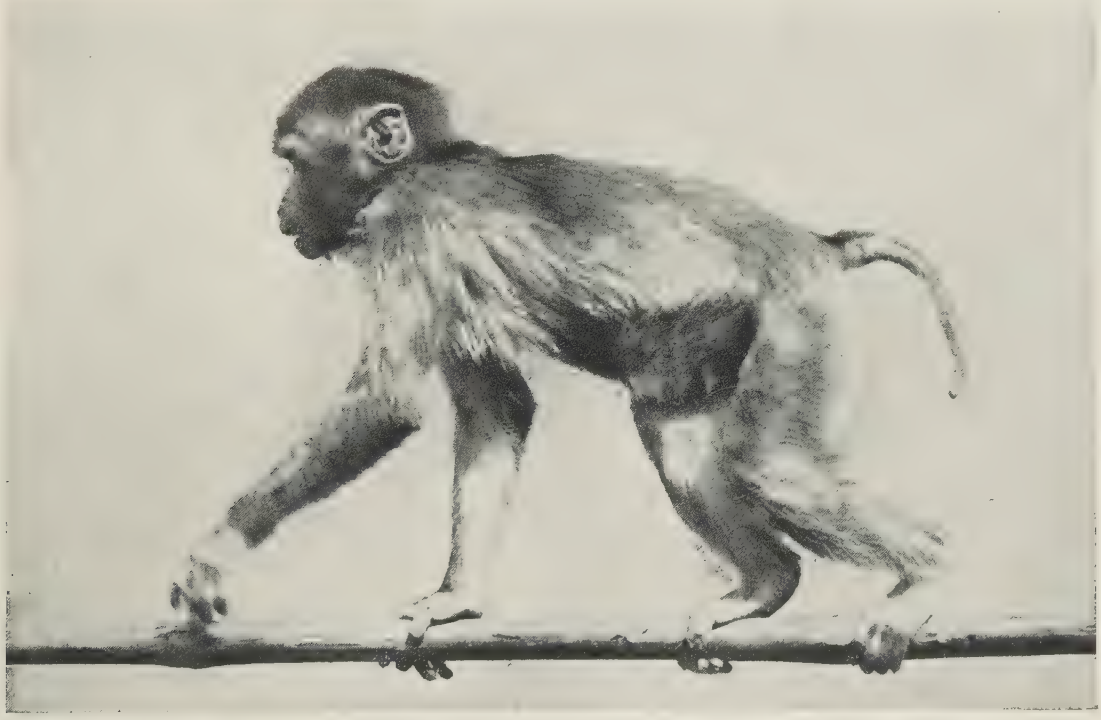


Photo by Ottomar Anschütz] [*Berlin*

PIG-TAILED MONKEY

"Footing the line." Note how the monkey uses its feet as hands when walking on a branch

A more ancient story deals with Alexander's campaigns. He encamped on a mountain on which were numerous bands of monkeys (probably baboons). On the following morning the sentries saw what looked like troops coming to offer them battle. As they had just won a victory, they were at a loss to guess who these new foes might be. The alarm was given, and the Macedonian troops set out in battle-array. Then through the morning mists they saw that the enemy was an immense troop of monkeys. Their prisoners who knew what the alarm was caused by, made no small sport of the Macedonians.

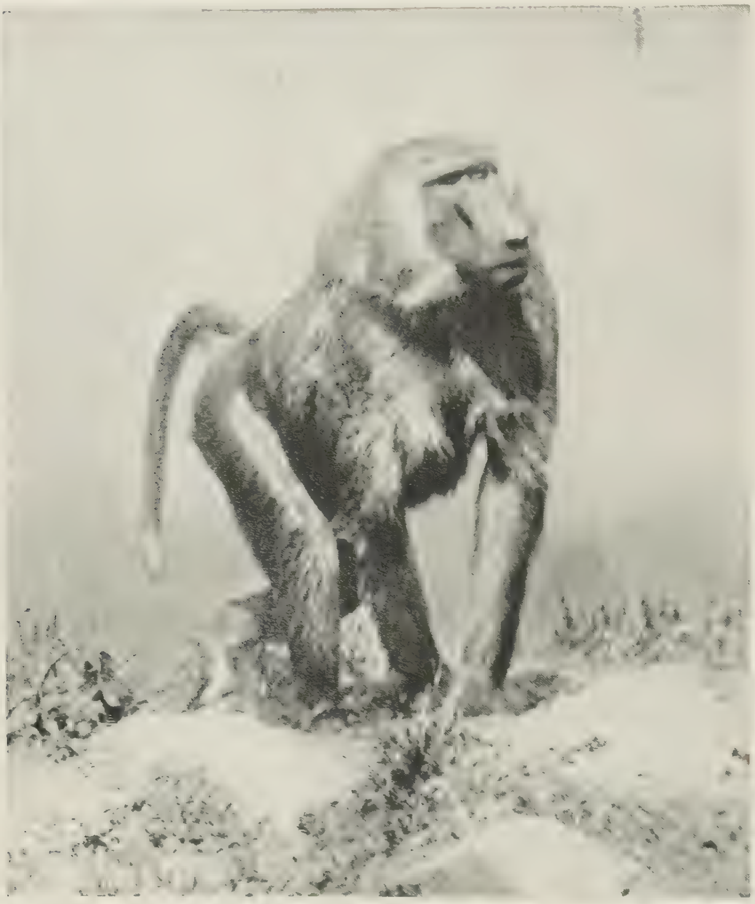


Photo by Ottomar Anschütz] *[Berlin*

CHACMA BABOON

This photograph shows his attitude when about to make an attack

The Speech of Monkeys

Something should be said of the alleged "speech of monkeys" which Professor Garner believed himself to have discovered. He rightly excluded mere sounds showing joy, desire, or sorrow from the faculty of speech, but claimed to have detected special words, one meaning "food," another "drink," another "give me that," another meaning "monkey," or an identification of a second animal or monkey. He used a phonograph to keep permanent record of the sounds, and made an expedition to the West African forests in the hope that he might induce the large anthropoid apes to answer the sounds which are so often uttered by their kind in our menageries. The enterprise ended, as might have been expected, in failure. Nor was it in the least necessary to go and sit in a cage in an African forest in the hope of striking up an acquaintance with the native chimpanzees. The little Capuchin monkeys, whose voices and sounds he had ample opportunity of observing here, give sufficient material for trying experiments in the meaning of monkey sounds. The writer believes that it is highly probable that the cleverer monkeys have a great many notes or sounds which the others do understand, if only because they make the same under similar circumstances, otherwise they would not utter them. They are like the sounds which an intelligent but nearly dumb person might make. Also they have very sharp ears, and some of them can understand musical sounds, so far as to show a very marked attention to them. The following account of an experiment of this kind, when a violin was being played, is related in "Life at the Zoo": "The Capuchin monkeys, the species selected by Professor Garner for his experiments in monkey language, showed the strangest and most amusing excitement. These pretty little creatures have very expressive and intelligent faces, and the play and mobility of their faces and voices while listening to the music were extraordinarily rapid. The three in the first cage at once rushed up into their box, and then all peeped out, chattering and excited. One by one they came down, and listened to the music with intense curiosity, shrieking and making faces at a crescendo, shaking the wires angrily at a discord, and

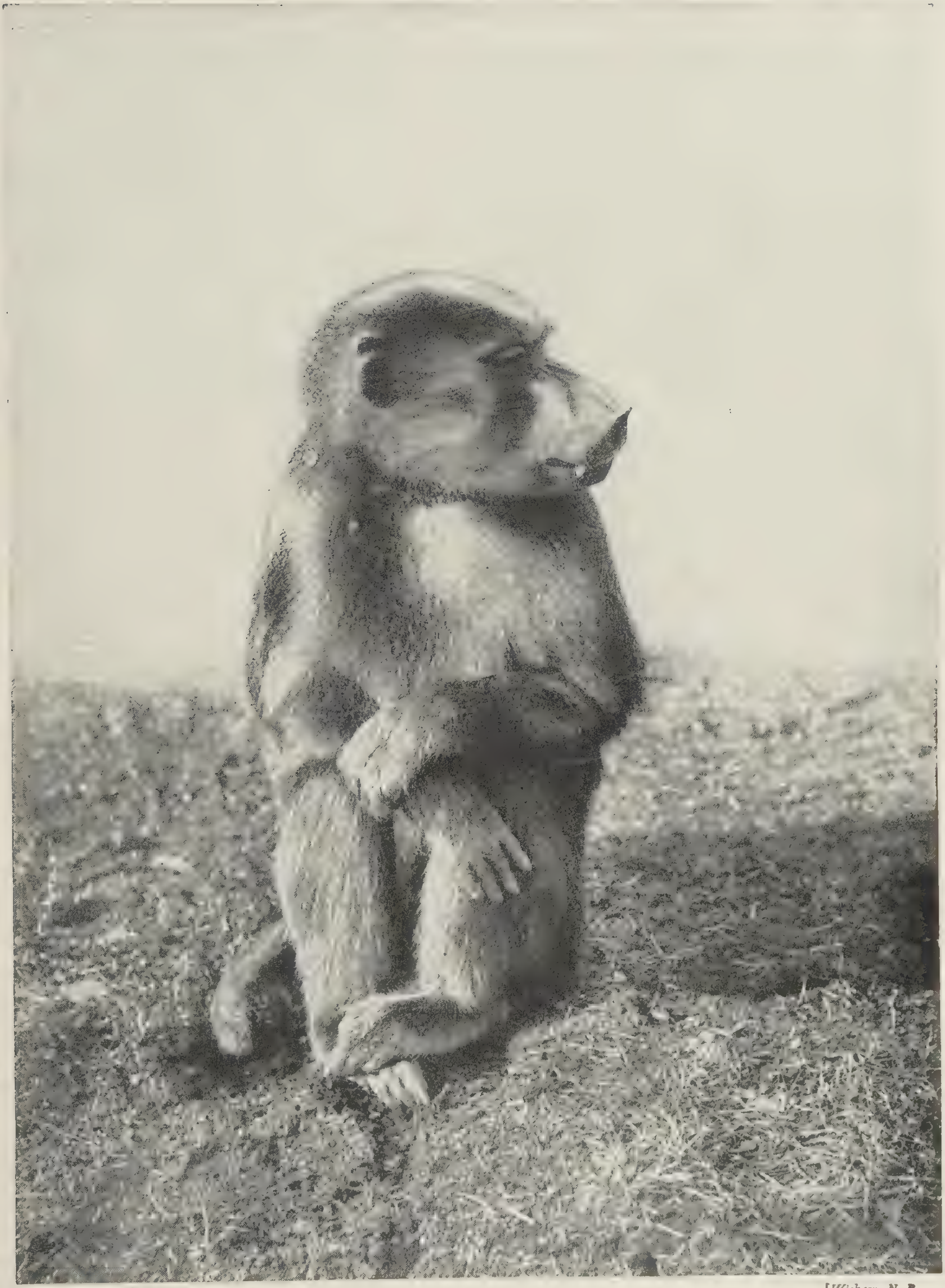


Photo by C. Reid] [*Wishaw, N. B.*

A YOUNG MALE CHACMA BABOON

Note the protruding tusk in the upper jaw. A baboon sitting in this position of rest can instantly leap six or seven feet, and inflict a dangerous bite putting their heads almost upside-down in efforts at acute criticism at low and musical passages. Every change of note was marked by some alteration of expression in the faces of the excited little monkeys, and a series of discordant notes roused them to a passion of rage." At the same time a big baboon, chained up near, evidently disliked it. He walked oft in the opposite direction to the farthest limits of his chain.

Photo by A. S. Rudland & Sons]

HEAD OF MALE MANDRILL

This is one of the most hideous of living animals. The natives of West Africa hold it in greater dislike even than the large carnivora, from the mischief it does to their crops

The American Monkeys

Mention of the Capuchins takes us to the whole group of the American Monkeys. Nearly all of these live in the tropical forests of Brazil, Guiana, Venezuela, and Mexico. They are all different from the Old World monkeys, and many are far more beautiful. The most attractive of the hardier kinds are the Capuchins; but there are many kinds of rare and delicate little monkeys more beautiful than any squirrel, which would make the most delightful pets in the world, if they were not so delicate. To try to describe the Old World monkeys in separate groups from end to end is rather a hopeless task. But the American monkeys are more manageable by the puzzled amateur. Most of them have a broad and marked division between the nostrils, which are not mere slits close together, but like the nostrils of men. They also have human-looking rounded heads. Their noses are of the "cogitative" order, instead of being snouts or snubs with narrow openings in them; and the whole face is in many ways human and intelligent. The Howler Monkeys, which utter the most hideous sounds ever heard in the forests, and the Spider Monkeys are the largest. The latter have the most wonderfully developed limbs and tails for catching and climbing of any living animals. As highly specialised creatures are always interesting, visitors to any zoological garden will find it worth while to watch a spider monkey climbing,

Photo by L. Medland, F.Z.S., North Finchley

BROWN CAPUCHIN

The most intelligent of the common monkeys of America. It uses many sounds to express emotions, and perhaps desires

Photo by L. Medland, F.Z.S., North Finchley

DRILL

Only less ugly than the Mandrill. Its habits are the same

Photo by A. S. Rudland & Sons

RED HOWLER MONKEY

The male possesses a most extraordinary voice

just as it is always worth while to watch a great snake on the move. The tail is used as a fifth hand: the Indians of Brazil say they catch fish with it, which is not true. But if you watch a spider monkey moving from tree to tree, his limbs and tail move like the five fingers of a star-fish. Each of the extremities is as sensitive as a hand, far longer in proportion than an ordinary man's arm, and apparently able to work independently of joints. The monkey can do so many things at once that no juggler can equal it. It will hold fruit in one hand, pick more with one foot, place food to the mouth with another hand, and walk and swing from branch to branch with the other foot and tail, all simultaneously. These monkeys have no visible thumb, though dissection shows that they have a rudimentary one; but the limbs are so flexible that they can put one arm round behind their heads over on to the opposite shoulder, and brush the fur on their upper arm. The end of the tail seems always "feeling" the air or surroundings, and has hairs, thin and long, at the end, which aid it in knowing when it is near a leaf or branch. It is almost like the tentacle of some sea zoophyte. Gentle creatures, all of them, are these spider monkeys. One of them, of the species called WAITA, when kept in captivity, wore the fur off its forehead by rubbing its long gaunt arms continually over its brow whenever it was scolded. The spider monkeys differ only in the degree of spidery slenderness in their limbs. In disposition they are always amiable, and in habits tree climbers and fruit-eaters.[1]

The CAPUCHINS are, in the writer's opinion, the nicest of all monkeys. Many species are known, but all have the same round merry faces, bright eyes, pretty fur, and long tails. There is always a fair number at the Zoological Gardens. They are merry, but full of fads. One hates children and loves ladies; another adores one or two other monkeys, and screams at the rest. All are fond of insects as well as of fruit. A friend of the writer kept one in a large house in Leicestershire. It was not very good-tempered, but most amusing, climbing up the blind-cord first, and catching and eating the flies on the window-panes most dexterously, always avoiding the wasps. This monkey was taught to put out a lighted paper (a useful accomplishment) by dashing its hands on to the burning part, or, if the paper were twisted up, by taking the unlighted end and beating the burning part on the ground; and it was very fond of turning the leaves of any large book. This it did not only by vigorous use of both arms and hands, but by putting its head under too, and "heaving" the leaves over.

Photo by A. S. Rudland & Sons

A SPIDER MONKEY

This monkey is specially adapted for arboreal life. The tail acts as a fifth hand

In the private room behind the monkey-house at the Zoo there are always a number of the

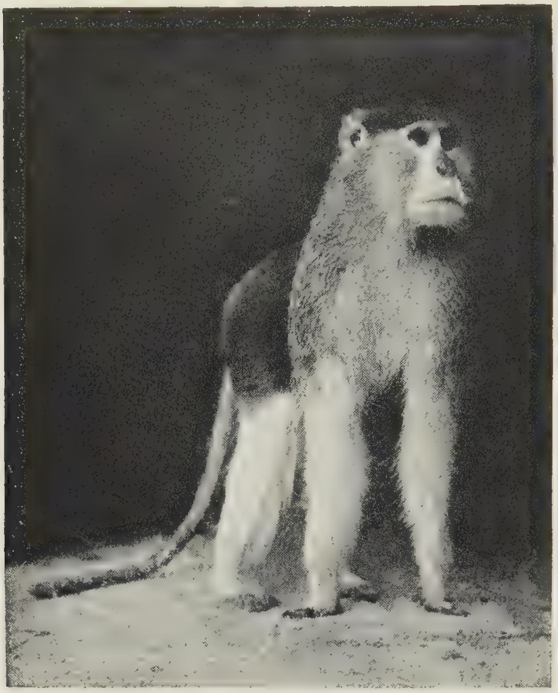


Photo by Scholastic Photo. Co.] [*Parson's Green*

PATAS MONKEY

Found in West Africa. A large and brilliantly coloured species

rare and delicate monkeys from America, which cannot stand the draughts of the outer house, like the Capuchins and spider monkeys. The greater number of these come from tropical America. There, in the mighty forests, so lofty that no man can climb the trees, so dense that there is a kind of upper story on the interlaced tree-tops, where nearly all the birds and many mammals live without descending to earth, forests in which there is neither summer nor winter, but only the changes from hour to hour of the equatorial day, the exquisite MARMOSETS, whose fur looks like the plumage and whose twittering voices imitate the notes of birds, live and have their being. They are all much alike in shape, except that the LION MARMOSET'S mane is like that of a little lion clad in floss silk; and they all have sharp little claws, and feed on insects. The PINCHÉ MARMOSET from the Guiana forests has a face like a black Indian chief, with white plumes over his head and neck like those worn by a "brave" in full war-paint. Merchants who do business with Brazil very frequently import marmosets and the closely allied tamarins as presents for friends at home in England; the Brazilians themselves like to have them as pets also; so there is to some extent a trade demand for them.

Among the most delicate of American monkeys are the OUKARIS, which have somewhat human faces, exquisite soft fur, and are as gentle as most of these forest creatures. They seldom live long in captivity, a few months being as much as they will generally endure, even in Brazil. Perhaps the rarest of all is the white-haired SCARLET-FACED OUKARI. This monkey has long white hair from neck to tail, sandy whiskers, and a bright scarlet face. It lives in a district of partly flooded forest, and is only obtained by the Indians using blow-pipes and arrows dipped in very diluted urari poison. The WHITE-HEADED SAKI is a rare and very pretty little monkey of Brazil; and there are a very large number of other species of this group whose names it would be mere weariness to mention. All these small monkeys are very quick and intelligent, while the rapidity of their movements, their ever-changing expression, and sharp, eager cries heighten the idea of cleverness given by their general appearance. Other little imps of these forests are the SQUIRREL MONKEYS. In the common species the face is like a little furry man's, its arms brilliant yellow (as if dipped in gamboge dye), the cheeks pink, and eyes black. In habits it is a quick-tempered, imperious little creature, carnivorous, and a great devourer of butterflies and beetles.

The most beautiful and entertaining of all monkeys are

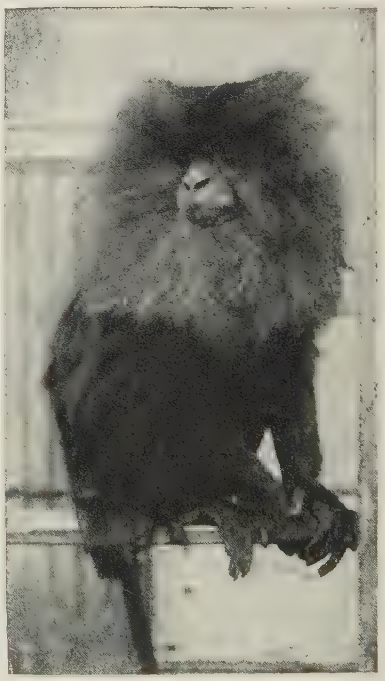


Photo by C. Reid] [*Wishaw, N. B.*

WANDEROO MONKEY

The number of monkeys which have leonine manes is large. The manes act as capes to keep the dew and wet from their chests and shoulders.

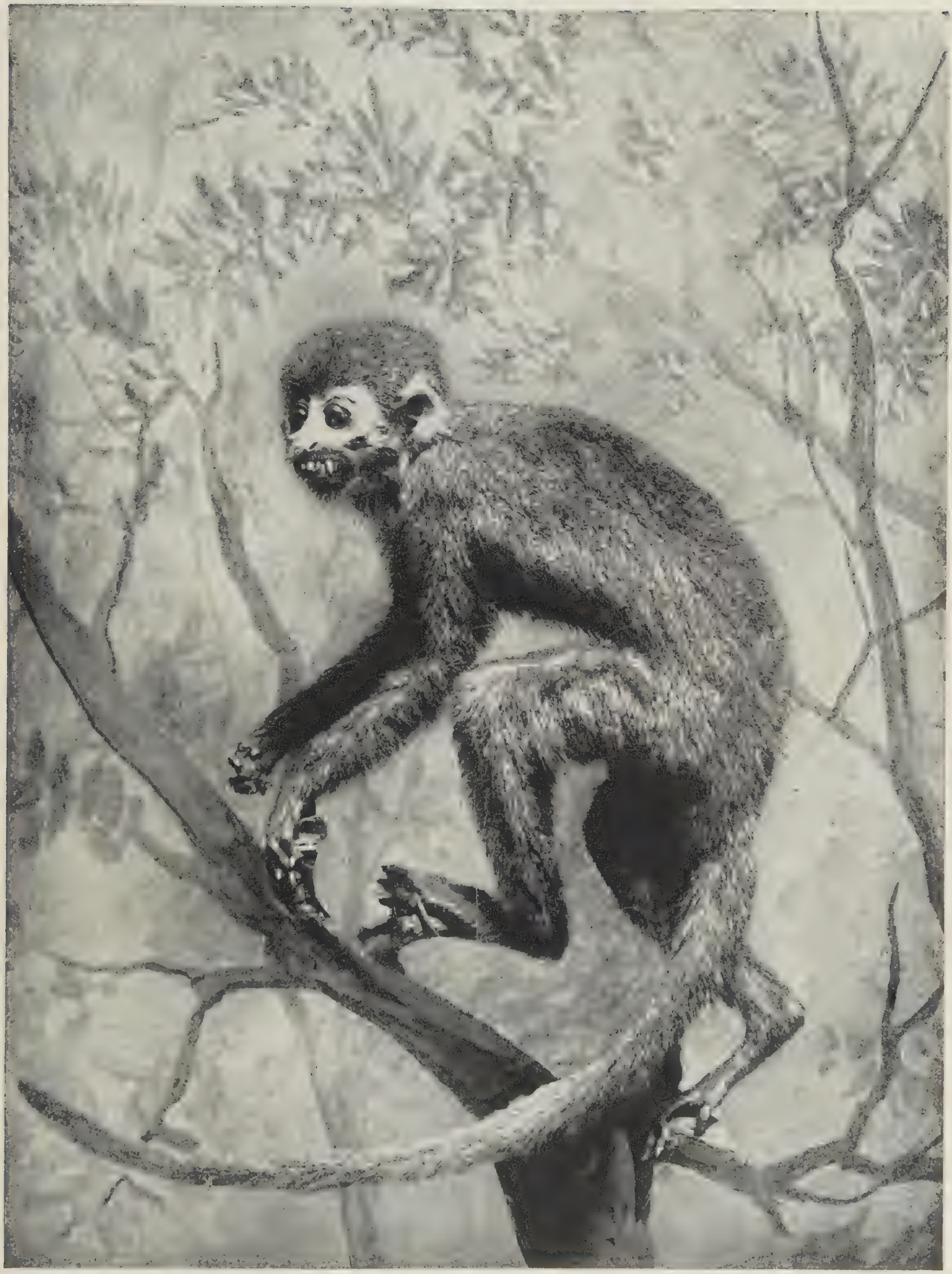


Photo by A. S. Rudland & Sons

COMMON SQUIRREL MONKEY

The squirrel monkeys have soft, bright-coloured fur, and long, hairy tails. They are found from Mexico to Paraguay

Photo by A. S. Rudland & Sons

BLACK-EARED MARMOSET

These are among the prettiest of small tropical monkeys in America: they are insect-feeders, and very delicate

these New World species. No person clever at interpreting the ways of animals would fail to consider them far more clever and sympathetic than the melancholy anthropoid apes, while for appearance they have no equals. Probably the most attractive monkey in Europe is a South American one now in the London Zoological Gardens. It was first mentioned to Europeans by Baron von Humboldt, who saw it in the cabin of an Indian on the Orinoco. These forest Indians of South America are gentle creatures themselves. Among other amiable qualities, they have a passion for keeping pets. One who worked for a friend of the writer, with others of his tribe, was asked what he would take in payment, which was given in kind. The others chose cloth, axes, etc. This Indian said that he did not care for any of these things. He said he wanted a "poosa." No one knew what he meant. He signed that he wished to go to the house and would show them. Arrived there, he pointed to the cat! "Pussy," to the Arawak Indian, was a "poosa," and that was what he wanted as a month's wages. Humboldt's Indian had something better than a "poosa." It was a monkey, as black as coal, with a round head, long thickly furred tail, and bright vivacious eyes. The explorer called it the LAGOTHRIX, which means Hare-skin Monkey. The fur is not the least like a hare's, but much resembles that of an opossum. The more suitable name is the WOOLLY MONKEY. The one kept at the Gardens is a most friendly and vivacious creature, ready to embrace, play and make friends with any well-dressed person. It dislikes people in working-clothes which are dirty or soiled—a not uncommon aversion of clever animals.

Photo by L. Medland, F.Z.S.] [North Finchley

HUMBOLDT'S WOOLLY MONKEY

This is the most popular monkey in captivity. He looks for all the world like a Negro, and has a most beautiful, soft, woolly coat. He is very tame, and loves nothing better than being petted

In spite of all the varieties of *temperament* in the monkey tribe, from the genial little Capuchins to the morose old baboon, they nearly all have one thing in common—that is, the monkey brain. The same curious restlessness, levity, and want of concentration mark them all, except the large anthropoid apes. Some of these have without doubt powers of reflection and concentration which the other monkeys do not possess. But in all the rest, though the capacity for understanding exists, the wish to please, as a dog does, and the desire to remember and to retain what it has learnt, seem almost entirely wanting. Egoism, which is a sign of humam dementia, is a very leading characteristic of all monkeys. There is no doubt that the baboons might be trained to be useful animals if they always served one master. Le Vaillant and many other travelers have noted this. But they are *too clever*, and at the bottom too ill-tempered ever to be trustworthy, even regarded as "watches," or to help in minor manual labour. Baboons would make an excellent substitute for dogs as used in Belgium for light draught; but no one could ever rely on their behaving themselves when their master's eye was elsewhere.

Taken as a family, the monkeys are a feeble and by no means likeable race. They are "undeveloped" as a class, full of promise, but with no performance.

THE LEMURS

THE South American monkeys, with their squirrel-like forms and fur, are followed by a beautiful and interesting group of creatures, called the LEMURS, with their cousins the Lorises, Maholis, and Pottos. Their resemblance to monkeys is mainly in their hands and feet. These are real and very highly developed hands, with proper thumbs. The second toe on the hind foot nearly always terminates in a long, sharp claw. "Elia," the Indian naturalist, who kept them as pets noticed that they used this to scratch themselves with. Some of them have the finger-tips expanded into a sensitive disk, full of extra nerves. Lemur means "ghost." "Unlike the lively squirrels and monkeys, they do not leave their hiding-places till the tropical darkness has fallen on the forest, when they seek their food, not by descending to the ground, but by ascending to the upper surface of the ocean of trees, and again, at the first approach of dawn, seek refuge from the light in the recesses of some dark and hollow trunk. The RING-TAILED LEMUR is as lively by day as night; but most of the race are so entirely creatures of darkness that the light seems to stupefy them. When wakened, they turn over like sleeping children, with the same inarticulate cries and deep, uneasy sighs. But at night most are astonishingly active; they fly from tree to tree, heard, but invisible; so that the natives of Madagascar doubt whether they are not true *lemures*, the unquiet ghosts of their departed dead.

Photo by Ottomar Anschütz] [*Berlin*

PIG-TAILED MONKEY CATCHING A FLY

Most of the smaller monkeys, as well as the baboons, are fond of eating insects. Beetles, white ants, and flies are eagerly sought and devoured

Though the lemurs are here treated apart from the other animals of Madagascar, it will be obvious that they are a curious and abnormal tribe. This is true of most of the animals of that great island, which has a fauna differing both from that of the adjacent coast of Africa and from that of India or Australia. In the FOSSA, a large representative of the Civets, it possesses a species absolutely unlike any other. The Aye-aye is also an abnormal creature. Nor must it be forgotten that Madagascar was until recently the home of some of the gigantic ground-living birds. But, after all, none of its inhabitants are more remarkable than its hosts of lemurs, some of which are to be met with in almost every coppice in the island. There are also many extinct kinds.

Exquisite fur, soft and beautifully tinted, eyes of extraordinary size and colour (for the pupil shuts up to a mere black line by day, and the rest of the eye shows like a polished stone of rich brown or yellow or marble gray), are the marks of most of the lemurs. But there are other lemur-like creatures, or "lemuroids," which, though endowed with the same lovely fur, like

Photo by L. Medland, F.Z.S.] [North Finchley

RING-TAILED LEMUR

This lemur is often kept as a domestic animal, and allowed to run about the house like a cat

softest moss, have no tails. The strangest of all are two creatures called the Slender Loris and the Slow Loris. The slender loris, which has the ordinary furry coat of the lemurs, and no tail, moves on the branches exactly as does a chameleon. Each hand or foot is slowly raised, brought forward, and set down again. The fingers then as slowly close on the branch till its grasp is secure. It is like a slow-working mechanical toy. Probably this is a habit, now instinctive, gained by ages of cautiously approaching insects. But the result is to give the impression that the creature is almost an automaton.

Madagascar is the main home of the lemurs, though some of the related animals are also found in Africa and in the East Indies. But the dense forests of the great island are full of these curious nocturnal beasts, of which there are so many varieties presenting very slight differences of form and habit, that naturalists have some difficulty in giving even a complete list of their species. Add to this that nearly all of them are intensely and entirely nocturnal, and the scarcity of data as to their habits is easily accounted for. When seen by us, their faces all lack expression—that is to say, the eyes, which mainly give expression, seem entirely vacant and meaningless. But this is due to their special adaptation to seeing in the dark tropical night. By day the pupil of the eye almost disappears. If only we could also see in the dark, the eyes of the lemur might have as much expression as those of a faithful dog. The change which night makes in their general demeanour is simply miraculous. By day many of them are like hibernating animals, almost incapable of movement. When once the curtain of night has fallen, they are as active as squirrels, and as full of play as a family of kittens. The Ring-tailed Lemur is often kept as a pet, both in Madagascar and in the Mauritius. It is one of the very few which are diurnal in their habits. When in a hurry it jumps along, standing on its hind feet, like a little kangaroo, but holding its tail upright behind its back. It will follow people up-stairs in this way, jumping from step to step, with its front paws outstretched, as if it were addressing an audience. The French call these day lemurs Makis. The ring-tailed lemur lives largely among rocks and precipices. Most of these creatures live upon fruit, the shoots and leaves of trees, and other vegetable food. But, like the squirrel, they have no objection to eggs and nestlings, and also kill and eat any small birds and insects. Some of the smaller kinds are almost entirely insect-feeders. The largest kind of lemur belongs to the group known as the Indris. The Black-and-white Indri measures about two feet in length. It has only a rudimentary tail, large ears, and a sharp-pointed nose. The amount of white colouring varies much in different individuals. This variation in colouring—a very rare feature among wild mammalia, though one of the first changes shown when animals are domesticated—is also found in the next three species, called Sifakas. The Diademed Sifaka, the Woolly

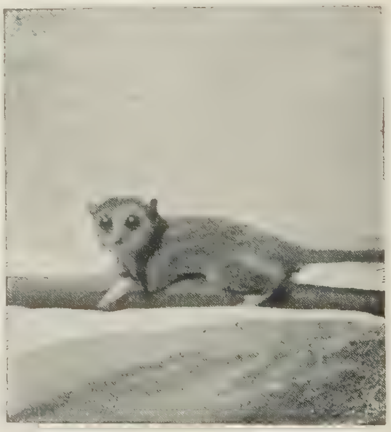


Photo by L. Medland, F.Z.S., North Finchley

A DWARF LEMUR

These tiny animals take the place of the dormouse in Madagascar

INDRI, and the BLACK INDRI all belong to this group. The SIFAKAS, as some of these and the allied forms are called, are venerated by the Malagasys, who never kill one intentionally. Mr. Foster observes that "they live in companies of six or eight, and are very gentle and inoffensive animals, wearing a very melancholy expression, and being as a rule morose, inactive, and more silent than the other lemurs. They rarely live long in captivity. In their native state they are most alert in the morning and evening, as during the day they conceal themselves under the foliage of trees. When asleep or in repose, the head is dropped on the chest and buried between the arms, the tail rolled up on itself and disposed between the hind legs. The sifakas live exclusively on vegetable substances, fruits, leaves, and flowers, their diet not being varied, as in the other lemurs, by small birds, eggs, or insects. Their life is almost entirely arboreal, for which the muscles of their hands and feet, as well as the parachute-like folds between their arms and bodies, and their peculiar hooked fingers, are well fitted. The young one is carried by the mother on its back, its hands grasping her armpits tightly."

Photo by L. Medland, F.Z.S.] *[North Finchley*

BLACK LEMUR

Found on the coast of Madagascar

Photo by L. Medland, F.Z.S., North Finchley

COQUEREL'S LEMUR

A lemur which strongly objects to being awakened in the daytime

This is not the universal way of carrying the young among lemurs. The CROWNED LEMUR, a beautiful gray-and-white species, often breeds at the Zoo. The female carries its young one partly on its side. The infant clings tightly with arms and tail round the very slender waist of the lemur, and pushes out its sharp little face just above the thigh of the mother. The WOOLLY INDRI has more woolly fur than the others of its tribe, a shorter nose, and a longer tail.

THE TRUE LEMURS

Of these there are several species, all confined to Madagascar and the Comoro Islands. One of the best known is the RING-TAILED LEMUR, mentioned above. It is called LEMUR CATTA, the Cat Lemur, from being so often kept in domestication. The WEASEL LEMUR, the GRAY LEMUR, the MOUSE LEMUR, the GENTLE LEMUR, the SPORTIVE LEMUR, the

Photo by L. Medland, F.Z.S.] *[North Finchley*

RUFFED LEMUR

Another of the nocturnal lemurs. It lives mainly on fruit and insects

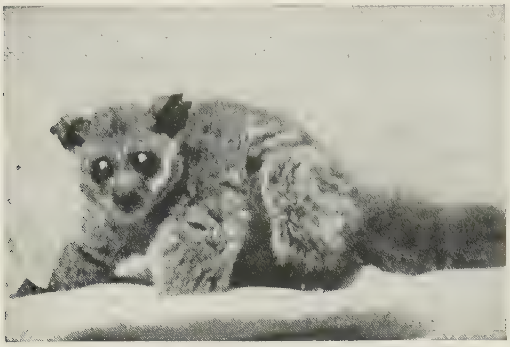


Photo by L. Medland, F.Z.S.] [*North Finchley*

GARNETT'S GALAGO

One of the squirrel-like lemuroids

CROWNED LEMUR, and COQUEREL'S LEMUR, all represent various small, pretty, and interesting varieties of the group. The BLACK-AND-WHITE LEMUR, one of the larger kinds, is capable of domestication. A specimen kept in a London house, where the present writer saw it, was always called " Pussy " by the children. The other small kinds are very like squirrels, mice, weasels, and other creatures, with which they have no connection. It seems as though the curiously limited and primitive fauna of Madagascar tried to make up for its want of variety by mimicking the forms of other animals, and something of the same kind is seen in Australia, where the marsupials take the place of all kinds of ordinary mammals. There are marsupial rats, marsupial wolves, marsupial squirrels, and even marsupial moles. The small squirrel and rat-like lemurs are called CHIROGALES. COQUEREL'S LEMUR is really a chirogale. It is a quaint and by no means amiable little animal, sleeping obstinately all day, and always ready to growl and bite if disturbed. Its colour is brownish gray and cream-colour. A pair of these, rolled up tightly into balls in a box of hay, will absolutely refuse to move, even when handled. They only feed by night.

THE GALAGOS

An allied group, confined to tropical Africa, is that of the GALAGOS. They are most beautiful little creatures, whose nearest relatives are the Malagasy lemurs. Generally speaking, they have even more exquisite fur than the lemurs. It is almost as soft as floss silk, and so close that the hand sinks into it as into a bed of moss. The colour of the fur is rich and pleasing, generally some shade of brown. The head is small, the nose pointed, and the ears thin, hairless, and capable of being folded up, like the wings of a beetle. But the most beautiful feature of the galagos is their eyes. These are of immense size, compared with the head. The eye is of the richest and most beautiful brown, like a cairngorm stone, but not glassy or clear. Though quite translucent, the eye is marked with minute dividing-lines, like the grain in an agate—a truly exquisite object. When handled or taken in the arms, the little galago clasps the fingers or sleeve tightly, as if it thought it was holding a tree, and shows no disposition to escape. A family of three or four young ones, no larger than mice, with their large-eyed mother attending to them, forms an exquisitely dainty little group. The galagos vary from the size of a squirrel to that of a small cat. The kind most often seen in England is the MAHOLI GALAGO from East Africa. Another species comes from Senegal, and others from Calabar and the forests of the Gold Coast. GARNETT'S GALAGO, another species, is shown above. They may be regarded as nocturnal tropical lemuroids, analogous to the chirogales of Madagascar. It has been suggested, with great probability, that the intensely drowsy sleep of many of the lemuroid animals corresponds to the hiberna-

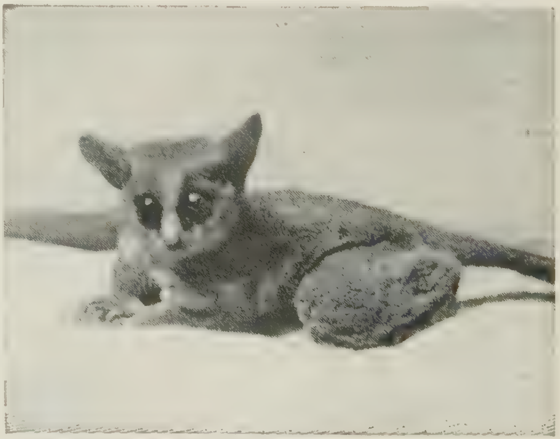


Photo by L. Medland, F.Z.S.] [*North Finchley*

MAHOLI GALAGO

This little animal is a native of East Africa. It has very large eyes, and fur as soft as the chinchilla's tion of many northern mammals. Tropical animals often become torpid to avoid the famine caused by the hot season, just as creatures in cold countries hibernate to avoid the hunger which would otherwise come with winter.

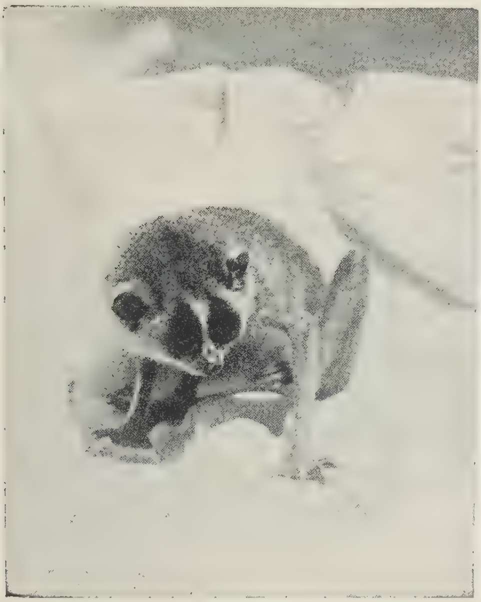


Photo by L. Medland, F.Z.S.] [North Finchley

SLENDER LORIS

This extraordinary creature has the habits of a chameleon when seeking insects for food. The photograph is unique

THE SLOW LEMURS OR LORISES, AND TARSIERS

Another group of lemuroids is distinguished from the foregoing by having the second finger of the fore paws either very short or rudimentary. The thumb and great toe are also set very widely apart from the other fingers and toes. A far more striking distinction to the non-scientific eye is their astonishingly deliberate and slow movements. They have no tails, enormous eyes, and very long, slender legs.

The SLOW LORIS is found in Eastern India and the Malay countries, where it is fairly common in the forests. The Bengali natives call it *sharmindi billi* ("bashful cat"), from its slow, solemn, hesitating movements when in pursuit of insects. Of a slow loris kept by him, Sir William Jones, in the "Asiatic Researches," wrote: "At all times he seemed pleased at being stroked on the head and throat, and he frequently allowed me to touch his extremely sharp teeth. But his temper was always quick, and when he was unseasonably disturbed he expressed a little resentment, by an obscure murmur, like that of a squirrel. . . . When a grasshopper or any insect alighted within his reach, his eyes, as he fixed them on his prey, glowed with uncommon fire; and having drawn himself back to spring on his prey with greater force, he seized it with both his fore paws, and held it till he had devoured it. He never could have enough grasshoppers, and spent the whole night in prowling for them."

The SLENDER LORIS, an equally curious creature, is only found in Southern India and Ceylon. Its food consists entirely of insects, which it captures by gradual, almost paralysed approach. Its has been described as a "furry-coated chameleon." A group of slow lemurs, living in Western Africa, are known as POTTOS. They are odd little quadrupeds, in which the "forefinger" never grows to be more than a stump. The tail is also either sharp or rudimentary. They are as slow as the lorises in their movements.

In the Malay islands a distant relative, even more curiously formed, is found in the TARSIER. It has the huge eyes, pointed ears, and beautiful fur of the galagos, but the tail is long, thin and tufted. The fingers are flattened out into disks, like a tree-frog's. These creatures hop from bough to bough in a frog-like manner in search of insects. They are not so large as a good-sized rat. Our photograph does not give an adequate idea of the size of the eyes.

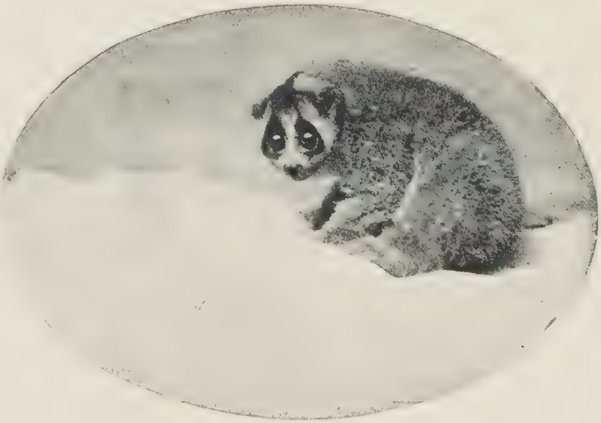


Photo by L. Medland, F.Z.S.] [North Finchley

SLOW LORIS

Another of the slow-moving loris group. These animals are not shown to the general public at the Zoo, but kept in a specially warmed room

Photo by A. S. Rudland & Sons

TARSIER

These little animals hop about in the trees like frogs. They are nocturnal, and seldom seen

THE AYE-AYE

Last, and most remarkable of all these weird lemuroids, is the AYE-AYE. It is placed in a group by itself, and has teeth like those of the Rodents, a large bushy tail, and most extraordinarily long, slender fingers, which it probably uses for picking caterpillars and grubs out of rotten wood. It is nearly as large as an Arctic fox, but its habits are those of a lemur. In Madagascar it haunts the bamboo forests, feeding on the juice of sugar-cane, grubs, and insects. The fingers of its hands are of different sizes and lengths, though all are abnormally long and slender. The second finger seems to have "wasted," but is said to be of the utmost value to its owner in extracting grubs and insects from the burrows in which they dwell, or the crannies in which they may have taken refuge. Very seldom is this animal seen alive in captivity. Although commonly called Aye-aye in this country, it is doubtful if this is really its native name. The aye-aye was long a puzzle to naturalists, but is now classed as a lemuroid.

THE living races of animals have thus far been reviewed along the completed list of the first great order—the Primates. Even in that circumscribed group how great is the tendency to depart from the main type, and how wonderful the adaptation to meet the various needs of the creatures' environment! The skeletons, the frames on which these various beings are built up, remain the same in character; but the differences of proportion in the limbs, of the muscles with which they are equipped, and of the weight of the bodies to be moved are astonishing. Compare, for instance, the head of the male Gorilla, with its great ridges of bone, to which are attached the muscles which enable it to devour hard tropical fruits and bite off young saplings and bamboos, with the rounded and delicate head of the Insect-eating Monkeys of South Africa; or set side by side the hand of the Chimpanzee with that of the Aye-aye, with its delicate, slender fingers, like those of a skeleton hand. What could be more diverse than the movements of these creatures, whose structure is nevertheless so much alike? Some of the lemuroids are as active as squirrels, flying lightly from branch to branch; in others, as the Slow Lorises, the power of rapid movement has disappeared, and been replaced by a creeping gait which cannot be accelerated. Already, in a single order, we see the rich diversity of nature, and its steady tendency to make all existing things serviceable by adapting other parts of creation to their use or enjoyment.

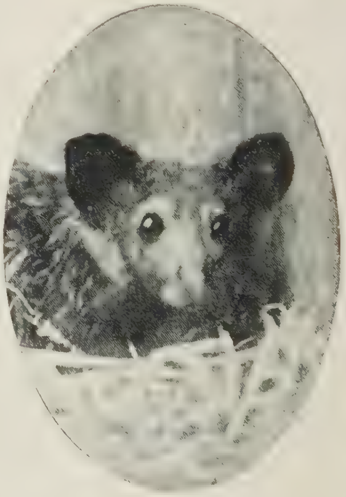


Photo by L. Medland, F.Z.S., N. Finchley

HEAD OF AYE-AYE

The aye-aye lives mainly in the wild sugar-cane groves, and feeds on insects and grubs, as well as on the juice of the sugar-cane

Photo by Fratelli Alinari] [*Florence*

AFRICAN LION

This lion is almost in the attitude of those sculptured by Sir Edwin Landseer for the Nelson Monument, but the feet are turned in, not lying flat

CHAPTER II

THE CAT TRIBE

THOUGH only one species is entirely domesticated, and none of the Cats have flesh edible by man, except perhaps the puma, no group of animals has attracted more interest than this. Containing more than forty species, ranging in size from the ox-devouring tiger or lion to the small wild cats, they are so alike in habit and structure that no one could possibly mistake the type or go far wrong in guessing at the habits of any one of them. They are all flesh-eaters and destroyers of living animals. All have rounded heads, and an extraordinary equipment of teeth and of claws, and of muscles to use them. The blow of the forearm of a lion or tiger is inconceivably powerful, in proportion to its size. A stroke from a tiger's paw has been known to strike off a native's arm from the shoulder and leave it hanging by a piece of skin, and a similar blow from a lion to crush the skull of an ox. The true cats are known by the power to draw back, or "retract," their claws into sheaths of horn, rendering their footsteps noiseless, and keeping these weapons always sharp. The hunting-leopard has only a partial capacity for doing this.

The characteristics of the Cats and their allies are too well known to need description. We will therefore only mention the chief types of the group, and proceed to give, in the fullest detail which space allows, authentic anecdotes of their life and habits. The tribe includes Lions, Tigers, Leopards, Pumas, Jaguars, a large number of so-called Tiger-cats (spotted and striped), Wild Cats, Domestic Cats, and Lynxes. The Hunting-leopard, or Cheeta, stands in a sub-group by itself, as does the Fossa, the only large carnivore of Madagascar.

By permission of Herr Carl Hagenbeck, Hamburg

AN UNWILLING PUPIL

This is one of Herr Hagenbeck's famous performing tigers

This closes the list of the most cat-like animals. The next links in the chain are formed by the Civets and Genets, creatures with more or less retractile claws, and long, bushy tails; the still less cat-like Binturong, a creature with a prehensile tail; and the Mongooses and Ichneumons, more and more nearly resembling the weasel tribe.

Photo by York & Son] [*Notting Hill*

LIONESS AROUSED

The pose of the animal here shows attention, but not anger or fear

THE LION

Recent intrusions for railways, sport, discovery, and war into Central and East Africa have opened up new lion countries, and confirmed, in the most striking manner, the stories of the power, the prowess, and the dreadful destructiveness to man and beast of this king of the Carnivora. At present it is found in Persia, on the same rivers where Nimrod and the Assyrian kings made its pursuit their royal sport; in Gujerat, where it is nearly extinct, though in General Price's work on Indian game written before the middle of the last century it is stated that a cavalry officer killed eighty lions in three years; and in Africa, from Algeria to the Bechuana country. It is especially common in Somaliland, where the modern lion-hunter mainly seeks his sport. On the Uganda Railway, from Mombasa to Lake Victoria, lions are very numerous and dangerous. In Rhodesia and the Northern Transvaal they have killed hunters, railway officials, and even our soldiers near Komati Poort. It has been found that whole tracts of country are still often deserted by their inhabitants from fear of lions, and that the accounts of their ravages contained in the Old Testament, telling how Samaria was almost deserted a second time from this cause, might be paralleled to-day.

The African Lion

BY F. C. SELOUS

When, in the latter half of the seventeenth century, Europeans first settled at the Cape of Good Hope, the lion's roar was probably to be heard almost nightly on the slopes of Table Mountain, since a quaint entry in the Diary of Van Riebeck, the first Dutch governor of the Cape, runs thus: "This night the lions roared as if they would take the fort by storm"—the said fort being situated on the site of the city now known as Cape Town.

At that date there can be little doubt that, excepting in the waterless deserts and the dense equatorial forests, lions roamed over the whole of the vast continent of Africa from Cape Agulhas to the very shore of the Mediterranean Sea; nor was their range very seriously curtailed until the spread of European settlements in North and South Africa, and the acquisition of firearms by the aboriginal inhabitants of many parts of the country, during the latter half of the nineteenth century, steadily denuded large areas of all wild game.

As the game vanished, the lions disappeared too; for although at first they preyed to a large extent on the domestic flocks and herds which gradually replaced the wild denizens of the

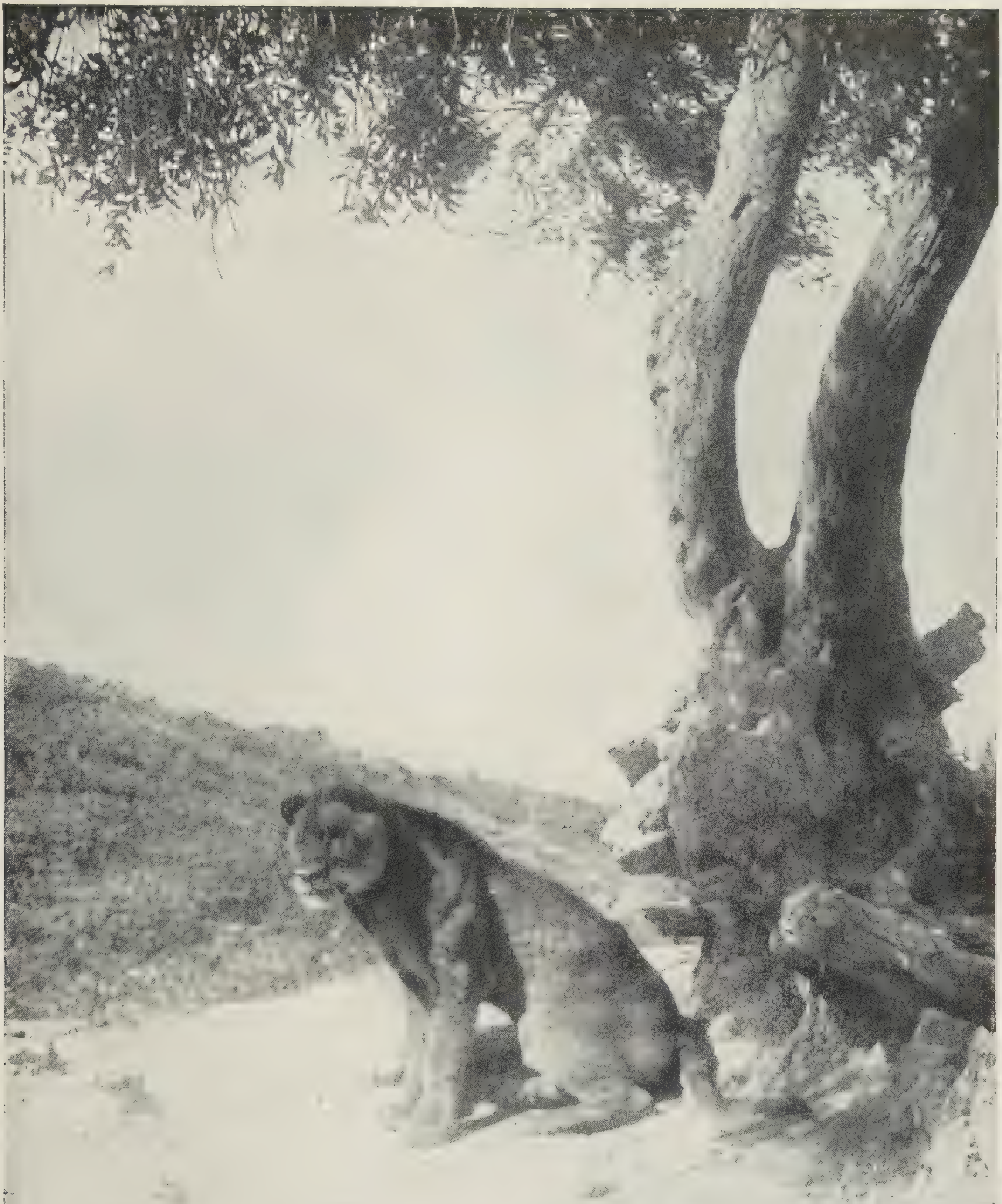
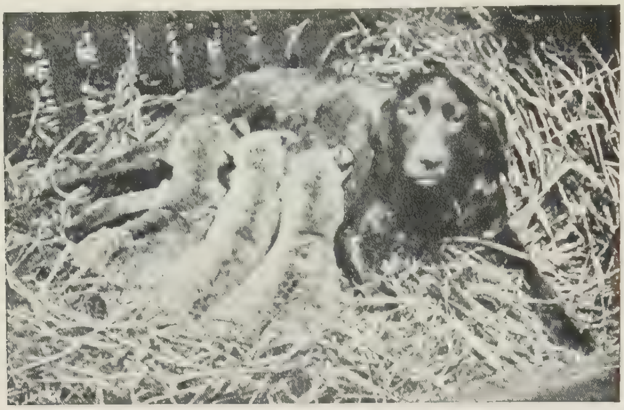


Photo by M. Geiser] [*Algiers*

ALGERIAN LIONESS

This lioness, sitting under an olive-tree, was actually photographed in the Soudan by the intrepid M. Geiser



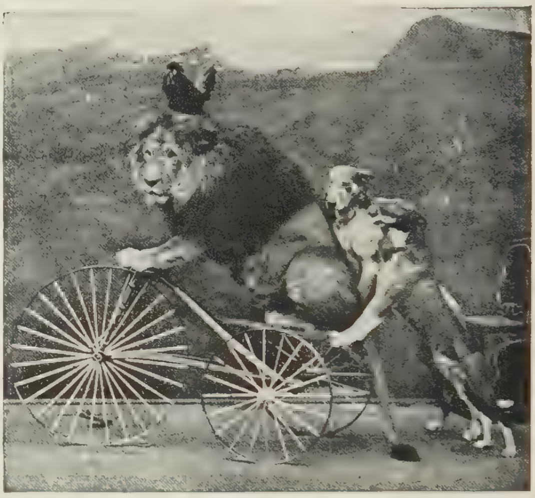
A FOSTER-MOTHER

This is a remarkable photograph of a setter suckling three lion cubs which had lost their mother. It is reproduced here by permission of the Editor of the Irish Field

once-uninhabited plains, this practice brought them into conflict with the white colonists or native herdsmen armed with weapons of precision, before whom they rapidly succumbed.

To-day lions are still to be found wherever game exists in any quantity, and their numbers will be in proportion to those of the wild animals on which they prey.

The indefinite increase of lions must be checked by some unknown law of nature, otherwise they would have become so numerous in the sparsely inhabited or altogether uninhabited parts of Africa, that they would first have exterminated all the game on which they had been wont to prey, and would then have had to starve or to have eaten one another. But such a state of things has never been known to occur; and whenever Europeans have entered a previously unexplored and uninhabited tract of country in Africa, and have found it teeming with buffaloes, zebras, and antelopes, they have always found lions in such districts very plentiful indeed, but never in such numbers as to seriously diminish the abundance of the game upon which they depended for food.



By permission of Herr Carl Hagenbeck] [*Hamburg*

A PERFORMING LION

Lions, it would seem, are capable of being taught almost anything, even tricycle-riding

Photo by G. W. Wilson & Co., Ltd.] [*Aberdeen*

LIONESS AND CUB

Lion cubs thrive both in Dublin and Amsterdam, but not so well at the London Zoo

It is easy to understand that the increase of a herd of herbivorous animals would be regulated by the amount of the food-supply available, as well as constantly checked by the attacks of the large carnivora, such as lions, leopards, cheetas, hyænas, and wild dogs; but I have never been able to comprehend what has kept within bounds the inordinate increase of lions and other carnivorous animals in countries where for ages past they have had an abundant food-supply, and at the same time, having been almost entirely unmolested by human beings, have had no enemies. Perhaps such a state of things does not exist at the present day, but there are many parts of Africa where such conditions have existed from time immemorial up to within quite recent years.

Since lions were once to be found over the greater portion of the vast continent of Africa, it is self-evident that these animals are able to accommodate themselves to great variations of climate and surroundings; and I myself have met with them, close to the sea, in the hot and sultry coastlands of Southeast Africa; on the high plateau of Mashonaland, where at an altitude of 6,000 feet above sea-level the winter nights are cold and frosty; amongst the stony hills to the east of the Victoria Falls of the Zambesi; and in the swamps of the Chobi. In the great reed-beds of the latter river a certain number of lions appeared to live constantly, preying on buffaloes and lechwe antelopes. I often heard them roaring at nights in these swamps, and I once saw two big male lions wading slowly across an open space between two beds of reeds in water nearly a foot in depth.

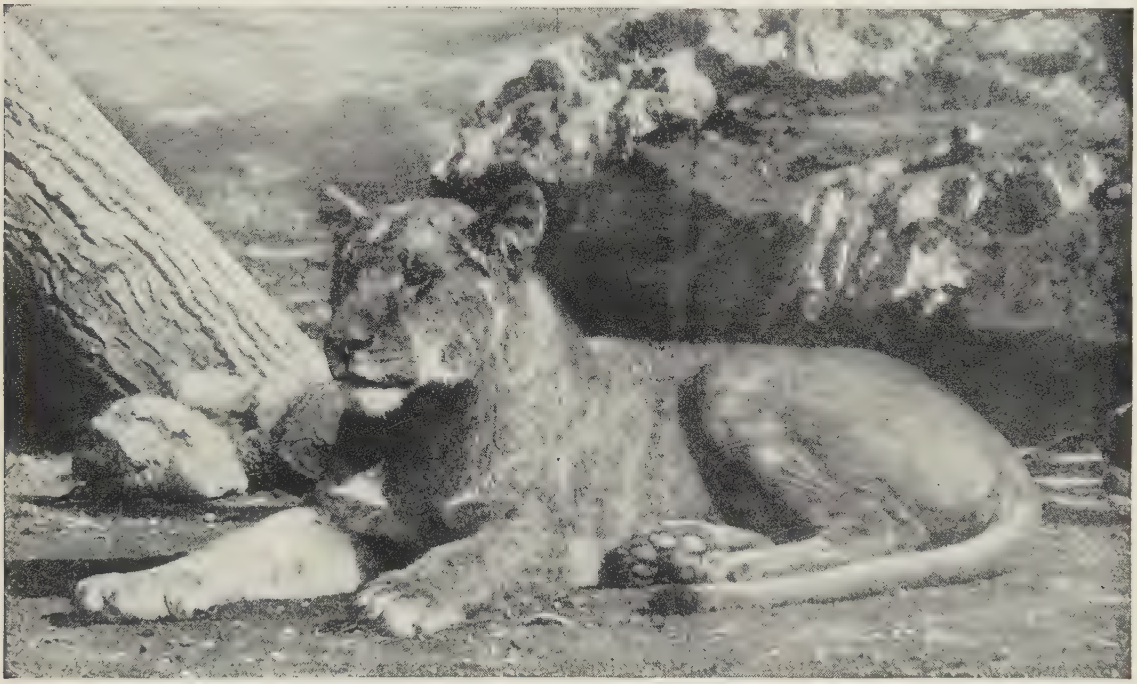


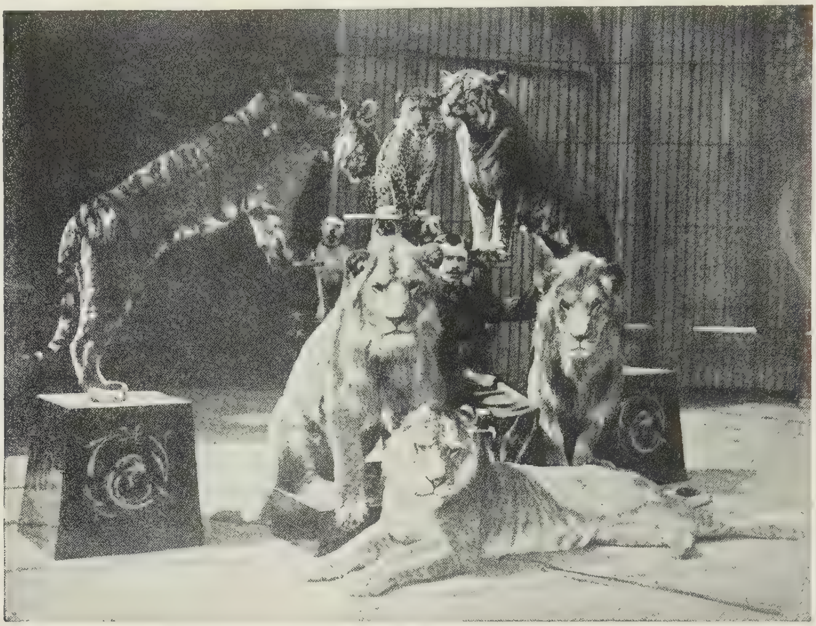
Photo by Fratelli Alinari] [*Florence*

A YOUNG LIONESS

The sole of the hind foot shows the soft pads on which the Cats noiselessly approach their prey

Although there are great individual differences in lions as regards size, general colour of coat, and more particularly in the length, colour, and profuseness of the mane with which the males are adorned, yet as these differences occur in every part of Africa where lions are met with, and since constant varieties with one fixed type of mane living by themselves and not interbreeding with other varieties do not exist anywhere, modern zoologists are, I think, now agreed that there is only one species of lion, since in any large series of wild lion skins, made in any particular district of Africa or Asia, every gradation will be found between the finest-maned specimens and those which are destitute of any mane at all. Several local races have, however, been recently described by German writers.

In the hot and steamy coastlands of tropical Africa lions usually have short manes, and never, I believe, attain the long silky black manes sometimes met with on the high plateaux of the interior. However, there is, I believe, no part of Africa where all or even the majority



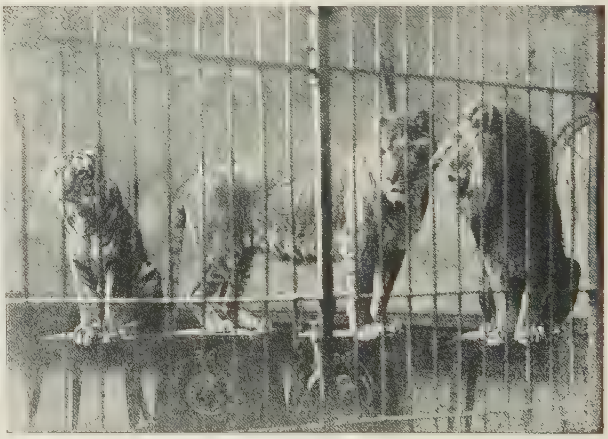
By permission of Herr Carl Hagenbeck] [Hamburg

A HAPPY FAMILY

Here is a group of animals and their keeper from Herr Hagenveck's Thierpark. The animal in front is a cross between a lion and a tigress; he lives on quite friendly terms with his keeper, and also with lions, tigers, and leopards, as seen in the photograph

of male lions carry heavy manes, the long hair of which does not as a rule cover more than the neck and chest, with a tag of varying length and thickness extending from the back of the neck to between the shoulder-blades. Lions with very full black manes, covering the whole shoulders, are rare anywhere, but more likely to be encountered on the high plateaux, where the winter nights are extremely cold, than anywhere else. In such cases, in addition to the tufts of hair always found on the elbows and in the armpits of lions with fair-sized manes, there will probably be large tufts of hair in each flank just where the thighs join the belly; but I have never yet seen the skin of a lion shot within the last thirty years with the whole belly covered with long, thick hair, as may constantly be observed in lions kept in captivity in menageries. There is, however, some evidence to show that, when lions existed on the high plains of the Cape Colony and the Orange River Colony, where the winter nights are much colder than in the countries farther north where lions may still be encountered, certain individuals of the species developed a growth of long hair all over the belly, as well as an extraordinary luxuriance of mane on the neck and shoulders.

From the foregoing remarks it will be seen that wild lions, having as a rule much less luxuriant manes than many examples of their kind to be seen in European menageries, are ordinarily not so majestic and dignified in appearance as many of their caged relatives. On the other hand, the wild lion is a much more alert and active animal than a menagerie specimen, and when in good condition is far better built and more powerful-looking, being free from all appearance of lankiness and weakness in the legs, and having strong, well-formed hindquarters. The eyes of the menagerie lion, too, look brown and usually sleepy, whilst those of the wild animal are yellow, and extraordinarily luminous even after death. When wounded and standing



By permission of Herr Carl Hagenbeck] [Hamburg

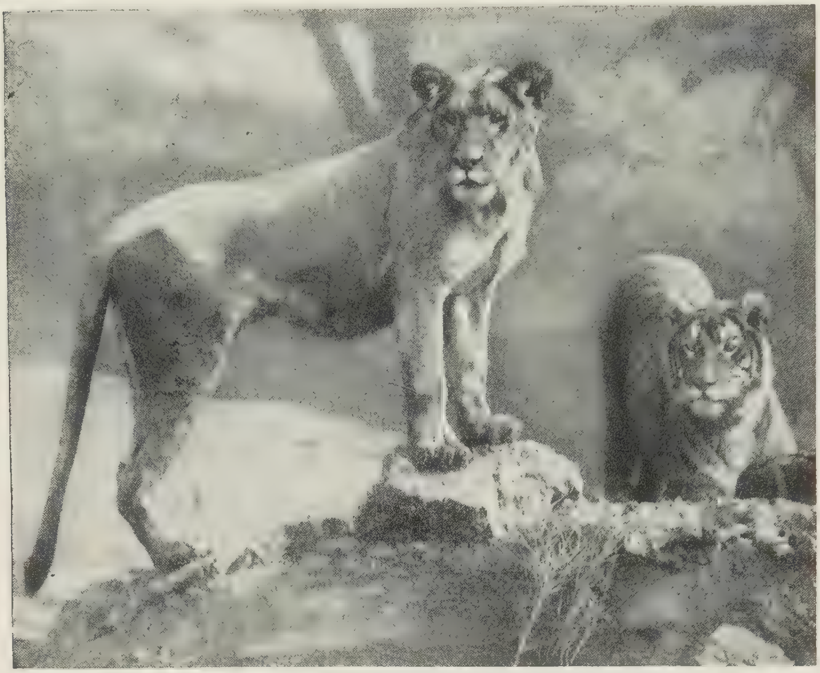
A CROSS BETWEEN LION AND TIGRESS

This unique photograph shows a remarkable hybrid and its proud parents. The father (on the right) is a lion, and the mother (on the left) a tigress. The offspring (in the centre) is a fine, large male, now four years old; it is bigger than an average-sized lion or tiger

Photo by Ottomar Anschütz] [Berlin

A HUNGRY LION

Notice that the mane, as in most wild lions, is very scanty



By permission of Herr Carl Hagenbeck] [*Hamburg*

LIONESS AND TIGER

The straightness of the lioness's tail is here shown. It is not in the least like that of the tiger or of the cat

at bay, with head held low between his shoulders, growling hoarsely, and with twitching tail, even if he is not near enough to be observed very closely, a lion looks a very savage and dangerous animal; but should he be wounded in such a way as to admit of a near approach—perhaps by a shot that has paralyzed his hind-quarters—his flaming eyes will seem to throw out sparks of living fire.

Speaking generally, there is little or no danger in meeting a lion or lions in the day-time. Even in parts of the country where fire-arms are unknown, and where the natives seldom or never interfere with them, these animals seem to have an instinctive fear of man, and even when encountered at the carcase of an animal freshly killed, and at a time when they may be supposed to be hungry, they will almost invariably retreat before the unwelcome presence, sometimes slowly and sulkily, but in districts where much hunting with firearms has been going on at a very rapid pace. However, I have known of two cases of Europeans mounted on horseback having been attacked by lions in broad daylight, and Dr. Livingstone mentions a third. In one of the instances which came within my own knowledge, a lion sprang at a Boer hunter as he was riding slowly along, carrying an elephant-gun in his right hand and followed by a string of natives on foot. The lion attacked from the left side, and with its right paw seized my friend from behind by the right side of his face and neck, inflicting deep gashes with its sharp claws, one of which cut right through his cheek and tore out one of his teeth. My friend was pulled from his horse, but, clutching the loosely girthed saddle tightly with his knees, it twisted round under the horse's belly before he fell to the ground. Instead of following up its success, the lion, probably scared by the shouting of the Kaffirs, trotted away for a short distance, and then turned and stood looking at the dismounted hunter, who, never having lost his presence of mind, immediately shot it dead with his heavy old muzzle-loading elephant-gun. Besides these three instances of Europeans having been attacked in the daytime by lions, I have known of a certain number of natives having been killed in broad daylight. Such incidents are, however, by no means every-day occurrences, and, speaking generally, it may be said that the risk of molestation by lions in Africa during daylight is very small. It is by night that lions roam abroad with stealthy step in search of prey; and at such times they are often, when hungry, incredibly bold and daring. I have known them upon several occasions to enter a hunter's camp, and, regardless of fires, to seize oxen and horses and human beings.

During the year following the first occupation of Mashonaland in 1890, a great deal of damage was done by lions, which could not resist the attractions of the settlers' live stock. For the first few months I kept as accurate an account as I could of the number of horses, donkeys, oxen, sheep, goats, and pigs which were killed by lions, and it soon mounted up to over 200 head. During the same time several white men were also mauled by lions, and one unfortunate man named Teale was dragged from beneath the cart, where he was sleeping by the side of a native driver, and at once killed and eaten. Several of the horses were killed inside rough shelters serving as stables. In the following year (1891) over 100 pigs were killed in one night by a single lioness. These pigs were in a series of pens, separated one from another, but all under one low thatched roof. The lioness forced her way in between two poles, and apparently was unable, after having satisfied her hunger, to find her way out again, and, becoming angry and frightened, wandered backwards and forwards through the pens, killing almost all the pigs, each one with a bite at the back of the head or neck. This lioness, which had only eaten portions of two young pigs, made her escape before daylight, but was killed with a set gun the next night by the owner of the pigs.

When lions grow old, they are always liable to become man-eaters. Finding their strength failing them, and being no longer able to hunt and pull down large antelopes or zebras, they are driven by hunger to killing small animals, such as porcupines, and even tortoises, or they may visit a native village and catch a goat, or kill a child or woman going for water; and finding a human being a very easy animal to catch and kill, an old lion which has once tasted human flesh will in all probability continue to be a man-eater until he is killed. On this subject, in his "Missionary Travels," Dr. Livingstone says: "A man-eater is invariably an old lion; and when he overcomes his fear of man so far as to come to villages for goats, the people remark, 'His teeth are worn; he will soon kill men.' They at once acknowledge the necessity of instant action, and turn out to kill him." It is the promptness with which measures are taken by the

Photo by Ottomar Anschütz] [Berlin

TIGRESS

Were the grass seen here the normal height of that in the Indian jungles, the upright lines would harmonise with the stripes, and render the tiger almost invisible

Photo by L. Medland, F.Z.S., North Finchley

TIGER CUB

Note the great development of the legs and paws

greater part of the natives of Southern Africa to put an end to any lion which may take to eating men that prevents these animals as a rule from becoming the formidable pests which man-eating tigers appear to be in parts of India. But man-eating lions in Africa are not invariably old animals. One which killed thirty-seven human beings in 1887, on the Majili River, to the north-west of the Victoria Falls of the Zambesi, was, when at last he was killed, found to be an animal in the prime of life; whilst the celebrated man-eaters of the Tsavo River, in East Africa, were also apparently strong, healthy animals. These two man-eating lions caused such consternation amongst the Indian workmen on the Uganda Railway that the work of construction was considerably retarded, the helpless coolies refusing to remain any longer in a country where they were liable to be eaten on any night by a man-eating lion. Both these lions were at last shot by one of the engineers on the railway (Mr. J. H. Patterson), but not before they had killed and devoured twenty-eight Indian coolies and an unknown number of native Africans.

THE TIGER

Tigers are the "type animal" of Asia. They are found nowhere else. Lions were inhabitants, even in historic times, of Europe, and are still common on the Euphrates and in parts of Persia, just as they were when the Assyrian kings shot them with arrows from their hunting-chariots. They survived in Greece far later than the days when story says that Hercules slew the Nemean lion in the Peloponnesus, for the baggage-animals of Xerxes' army of invasion were attacked by lions near Mount Athos. But the tiger never comes, and never did come in historic times, nearer to Europe than the Caucasian side of the Caspian Sea. On the other hand, they range very far north. All our tiger-lore is Indian. There is scarcely a story of tigers to be found in English books of sport which deals with the animal north of the line of the Himalaya. These Chinese northern tigers and the Siberian tigers are far larger than those of India. They have long woolly coats, in order to resist the cold. Their skins are brought to market in hundreds every year to the great fur-sales. But the animals themselves we never see. The present writer was informed by a friend that in the Amur

Photo by Valentine & Sons, Ltd.] [*Dundee*

A ROYAL TIGER

This is an old Bengal Tiger, with the smooth, short coat grown in that hot climate

Photo by Fratelli Alinari] *[Florence*

A TIGER BEFORE SLEEPING

Tigers, when about to sleep, sit in this position; when more drowsy, they lie down or roll over on their backs

Valley he shot three of these tigers in a day, putting them up in thick bush-scrub by the aid of dogs.

The Royal Bengal Tiger, so called, and very properly called in the old books of natural history, is a different and far more savage beast. It is almost *invariably* a ferocious savage, fierce by nature, never wishing to be otherwise than a destroyer—of beasts mainly, but often of men. Compared with the lion, it is far longer, but rather lighter, for the lion is more massive and compact. "A well-grown tigress," says Sir Samuel Baker, "may weigh on an average 240 lbs. live weight. A very fine tiger may weigh 440 lbs., but if fat the same tiger would weigh 500 lbs. There may be tigers which weigh 50 lbs. more than this; but I speak according to my experience. I have found that a tiger of 9 feet 8 inches is about 2 inches above the average. The same skin may be *stretched* to measure 10 feet. A tiger in the Zoological Gardens is a long, lithe creature with little flesh. Such a specimen affords a poor example of this grand animal in its native jungles, with muscles in their full, ponderous development from continual exertion in nightly travels over long distances, and in mortal struggles when wrestling with its prey. A well-fed tiger is by no means a slim figure. On the contrary, it is exceedingly bulky, broad in the shoulders, back, and loins, and with an extraordinary girth of limbs, especially in the forearms and wrists."

This ponderous, active, and formidably armed creature is, as might be expected, able to hold its own wherever Europeans do not form part of the regular population. In India the peasants are quite helpless even against a cattle-killing tiger in a populous part of the country. In the large jungles, and on the islands at the mouths of the great rivers, the tigers have things all their own way. Things are no better in the Far East. A large peninsula near Singapore is said to have been almost abandoned by its cultivators lately, owing to the loss of life caused by the tigers. In the populous parts of India the tiger is far more stealthy than in the out-of-the way districts. It only hunts by night; and after eating a part of the animal killed, moves off to a distance, and does not return. Otherwise the regular habit is to return to the kill just at or after dusk, and finish the remainder. Its suspicions seem quite lulled to sleep after dark. Quite recently a sportsman sat up to watch for a tiger at a water-hole. It was in the height of the Indian hot season, when very little water was left. All the creatures of that particular neighbourhood were in the habit of coming to drink at one good pool still left in the rocky bed of the river. There the tigers came too. The first night they did not come until all the other creatures —hog, deer, peacocks, and monkeys—had been down to drink. They then came so softly over the sand that the gunner in waiting did not hear them pass. His first knowledge that they were there was due to the splashing they made as they entered the water. It was quite dark, and he felt not a little nervous, for the bush on which he was seated on a small platform was only some 10 feet high. He heard the two tigers pass him, not by their footsteps, but by the dripping of the water as it ran off their bodies on to the sand. Next night they came again. This time, though it was dark, he shot one in a very ingenious manner. The two tigers walked into the water, and apparently lay down or sat down in it, with their heads out. They only moved occasionally, lapping the water, but did not greatly disturb the surface. On this was reflected a bright star from the sky above. The sportsman put the sight of the rifle on the star, and kept it up to his shoulder. Something obliterated the star, and he instantly fired. The "something" was the tiger's head, which the bullet duly hit.

Photo by Scholastic Photo. Co.] [*Parson's Green*

A HALF-GROWN TIGER CUB

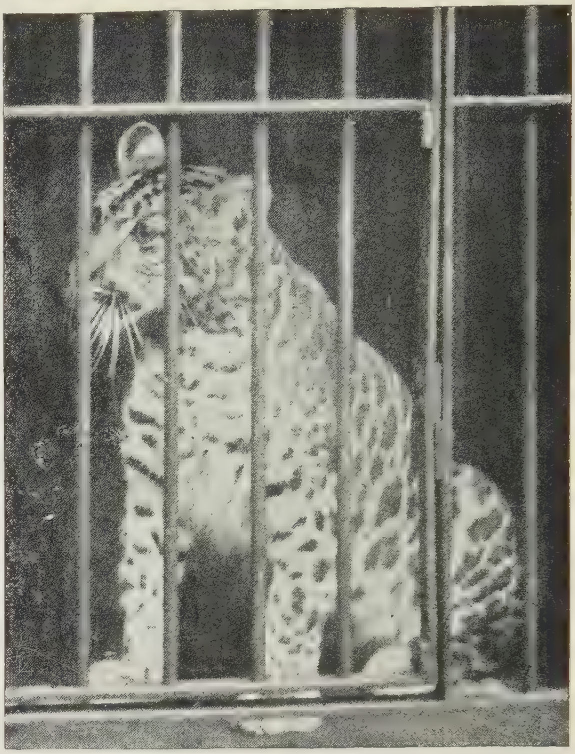
Tigers "grow to their head," like children. The head of a half-grown cub is as long, though not so broad, as that of the adult

The hill-tigers of India are, or were, much more given to hunting by day than the jungle-tigers. In the Nilgiri Hills of Southern India the late General Douglas Hamilton said that before night the tigers were already about hunting, and that in the shade of evening it was dangerous to ride on a pony—not because the tigers wished to kill the rider, but because they might mistake the pony and its rider for a sambar deer. He was stalked like this more than once. Often, when stalking sambar deer and ibex by day, he saw the tigers doing the same, or after other prey. "My brother Richard," he writes, "was out after a tiger which the hillmen reported had killed a buffalo about an hour before. He saw the tiger on first getting to the ground, and the tiger had seen him. It was lying out in the open watching the buffalo, and shuffled into the wood, and would not come out again. Next morning, when we got to the ground, the tiger was moving from rock to rock, and had dragged the body into a nullah. . . . We were upon the point of starting home when we observed a number of vultures coming down to the carcase. The vultures began to collect in large numbers on the opposite hill. I soon counted fifty; but they would not go near the buffalo. Then some crows, bolder than the rest, flew down, and

Photo by Fratelli Alinari] [*Florence*

TIGERS IN ITALY

These tigers were photographed in Turin. Italy was the first European country to which these animals were brought from the East



By permission of Herr Carl Hagenbeck]

A LEOPARD-PUMA HYBRID

This is a photograph from life of a very rare hybrid. The animal's father was a puma, its mother a leopard. It is now dead, and may be seen stuffed in Mr. Rothschild's Museum at Tring

made a great row over their meal. All of a sudden they all flew up, and I made certain it was the tiger. Then my brother fired, and there he was, shot right through the brain, lying just above the buffalo. He had been brought down by the noise the crows were making. Upon driving the *sholas* (small woods on these hills), tigers were often put out. Sometimes they availed themselves of the drive to secure food for themselves. A wood was being driven, when a tremendous grunting was heard, and out rushed an old boar, bristling and savage. B—— was about to raise his rifle, when a growl like thunder stopped him, and a great tiger with one spring cleared the nullah, and alighted on the back of the old boar. Such a battle then took place that, what with the growls of the tiger and the squeals of the boar, one might believe oneself in another world. I thought of nothing but of how to kill one or the other, or both; so, as they were rolling down over and over, about fifty yards from me on the open hill-side, I let fly both barrels. For a second or two the noise went on; then the tiger jumped off, and the boar struggled into the nullah close by. The tiger pulled up, and coolly stared at us without moving; but his courage seemed to fail him, and he sprang into the nullah and disappeared."

In most parts of India tigers are now scarce and shy, except in the preserves of the great rajas, and the dominions of some mighty and pious Hindu potentates, such as the Maharaja of Jeypur, who, being supposed to be descended from a Hindu god, allows no wild animals to be killed. There the deer and pig are so numerous that tigers are welcome to keep them down. But the Sunderbunds, unwholesome islands at the Ganges mouth, still swarm with them. So does the Malay Peninsula.

Mr. J. D. Cobbold shot a tiger in Central Asia in a swamp so deep in snow and so deadly cold that he dared not stay for fear of being frozen to death. Tigers sometimes wander as far west as the Caucasus near the Caspian. The farther north, the larger your tiger, is the rule. The biggest ever seen in Europe was a Siberian tiger owned by Herr Carl Hagenbeck, of Hamburg, and the largest known skin and skull is from the Far North. The skin is 13 feet 6 inches from the nose to the end of the tail. The

Photo by L. Medland, F.Z.S.] [*North Finchley*

LEOPARDS

A pair of leopards, one spotted, the other black. Black leopards may be the offspring of the ordinary spotted form; they are generally much more savage largest Indian tiger-skin, from one killed by the Maharaja of Cuch Behar, measures 11 feet 7 inches.

LEOPARDS

Less in size, but even more ferocious, the **Leopard** has a worse character than the tiger. Living mainly in trees, and very nocturnal, this fierce and dangerous beast is less often seen than far rarer animals. It is widely spread over the world, from the Cape of Good Hope to the Atlas Mountains, and from Southern China to the Black Sea, where it is sometimes met with in the Caucasus. There seems to be no legend of its presence in Greece, Italy, or Spain; but it was quite common in Asia Minor; and Cicero, when governor of Cilicia, was plagued by an aristocratic young friend in Rome to send him leopards to exhibit in a *fête* he was giving.

Any one who has frequented the Zoo for any time must have noticed the difference in size and colour between leopards from different parts of the world. On some the ground-colour is almost white, in others a clear nut-brown. Others are jet-black. Wherever they live, they are cattle thieves, sheep thieves, and dog thieves. Though not formidable in appearance, they are immensely strong. Sometimes one will turn man-eater. Both in India and lately in Africa cases have been known where they have "set up" in this line as deliberately as any tiger. They have four or five young at a birth, which may often be kept tame for some time and are amusing pets. But the following plain story shows the danger of such experiments. At Hongkong an English merchant had a tame leopard, which was brought into the room by a coolie for the guests to see at a dinner party. Excited by the smell of food, it refused to go out when one of the ladies, who did not like its looks, wished for it to be removed. The man took hold of its collar and began to haul it out. It seized him by the neck, bit it through, and in a minute the coolie was dying, covered with blood, on the dining-room floor!

The Chinese leopard ranges as far north as the Siberian tiger, and, like the latter, seems to grow larger the farther north it is found. The colour of these northern leopards is very

Photo by C. Reid *[Wishaw, N. B.*

A YOUNG LEOPARD

The leopard cub is far more cat-like in appearance than the young tiger or lion pale, the spots large, and the fur very long. At the March fur-sales of the present year, held at the stores of Sir Charles Lampson, there were Siberian leopard-skins as large as those of a small tiger.

Leopards are essentially tree-living and nocturnal animals. Sleeping in trees or caves by day, they are seldom disturbed. They do an incredible amount of mischief among cattle, calves, sheep, and dogs, being especially fond of killing and eating the latter. They seize their prey by the throat, and cling with their claws until they succeed in breaking the spine or in strangling the victim. The largest leopards are popularly called PANTHERS. In India they sometimes become man-eaters, and are always very dangerous. They have a habit of feeding on putrid flesh; this makes wounds inflicted by their teeth or claws liable to blood-poisoning. Nothing in the way of prey comes amiss to them, from a cow in the pasture to a fowl up at roost. "In every country," says Sir Samuel Baker, "the natives are unanimous in saying that the leopard is more dangerous than the lion or tiger. Wherever I have been in Africa, the natives have declared that they had no fear of a lion, provided they were not hunting, for it would not attack unprovoked, but that a leopard was never to be trusted. I remember when a native boy, accompanied by his grown-up brother, was busily employed with others in firing the reeds on the opposite bank of a small stream. Being thirsty and hot, the boy stooped down to drink, when he was immediately seized by a leopard. His brother, with admirable aim, hurled his spear at the leopard while the boy was in his jaws. The point separated the vertebræ of the neck, and the leopard fell stone-dead. The boy was carried to my hut, but there was no chance of recovery. The fangs had torn open the chest and injured the lungs. These were exposed to view through the cavity of the ribs. He died the same night."

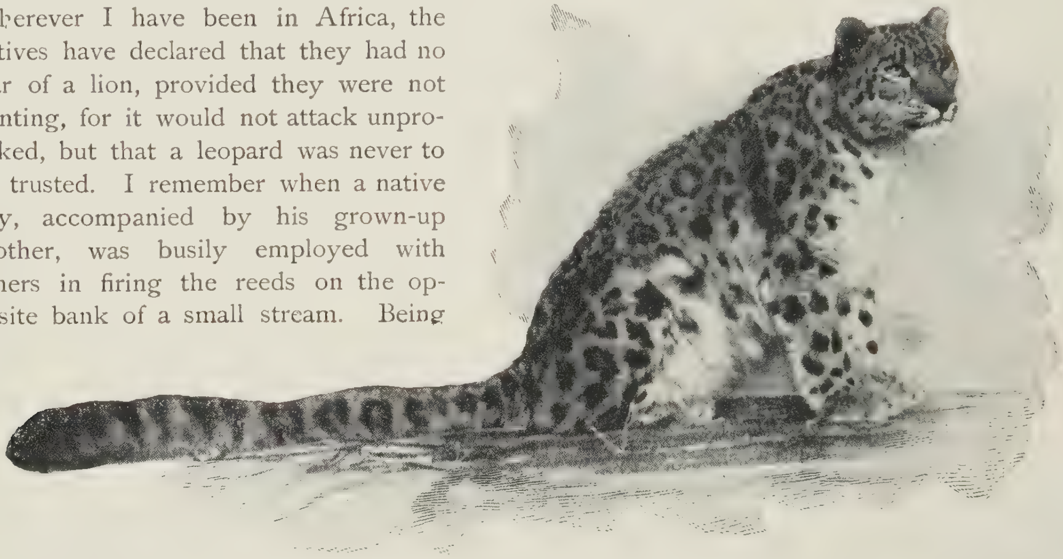


Photo by J. W. McLellan] [*Highbury*

SNOW-LEOPARD, OR OUNCE

This is a striking portrait of a very beautiful animal. Note the long bushy tail, thick coat, and large eyes

In the great mountain-ranges of Central Asia the beautiful SNOW-LEOPARD is found. It is a large creature, with thick, woolly coat, and a long tail like a fur boa. The colour is white, clouded with beautiful gray, like that of an Angora cat. The edges of the cloudings and spots are marked with black or darker gray. The eyes are very large, bluish gray or smoke-coloured. It lives on the wild sheep, ibex, and other mountain animals. In captivity it is far the tamest and gentlest of the large carnivora, not excepting the puma. Unlike the latter, it is a sleepy, quiet animal, like a domestic cat. The specimen shown here belonged to a lady in India, who kept it for some time as a pet. It was then brought to the Zoological Gardens, where it was more amiable and friendly than most cats. The writer has entered its cage with the keeper, stroked it, and patted its head, without in the least ruffling its good-temper. The heat of the lion-house did not suit it, and it died of consumption.

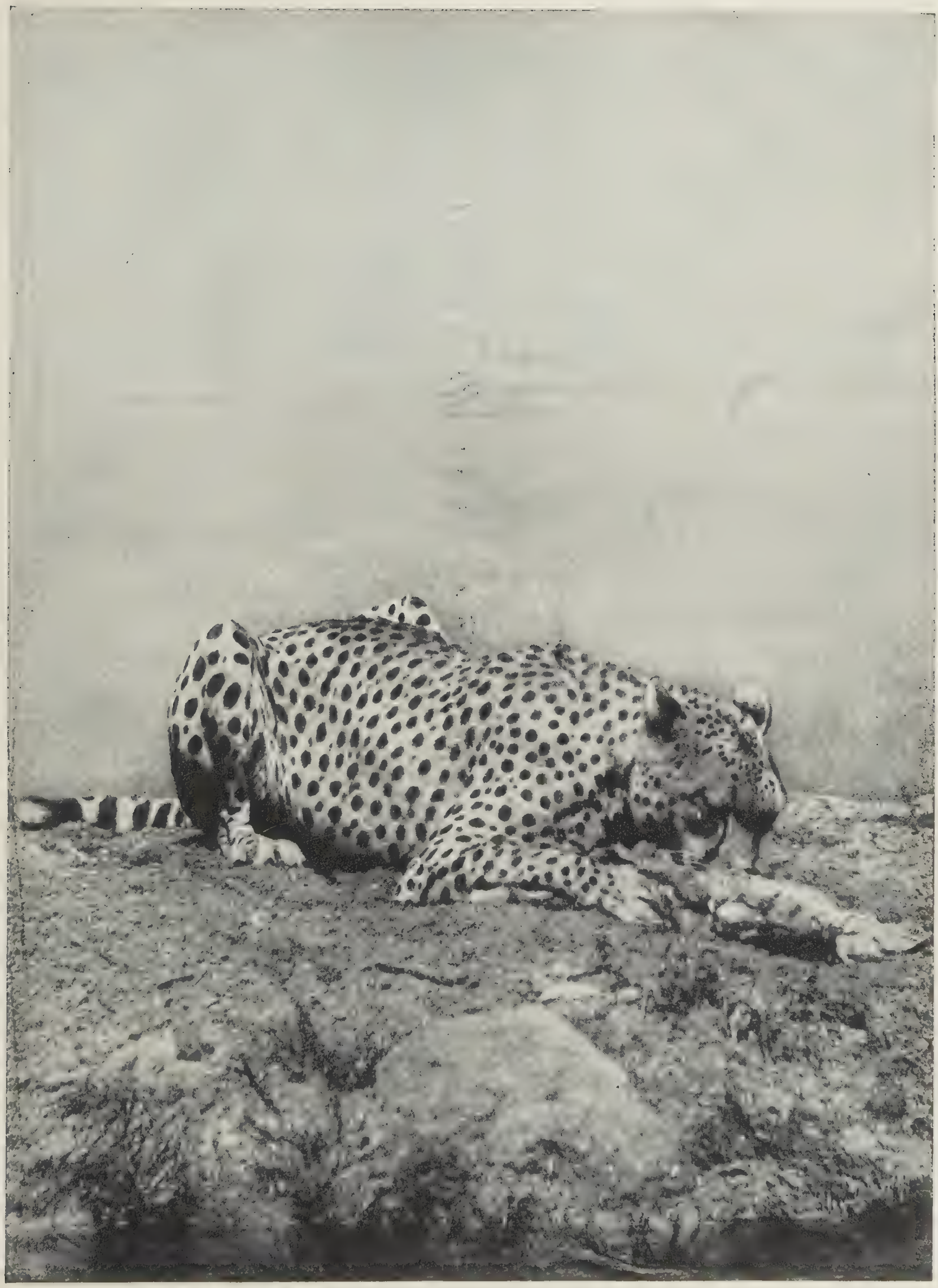


Photo by Ottomar Anschütz] [*Berlin*

CHEETA

A cheeta is a hunting-leopard; this one is a particularly large specimen. The cheetas are dealt with later on in this chapter

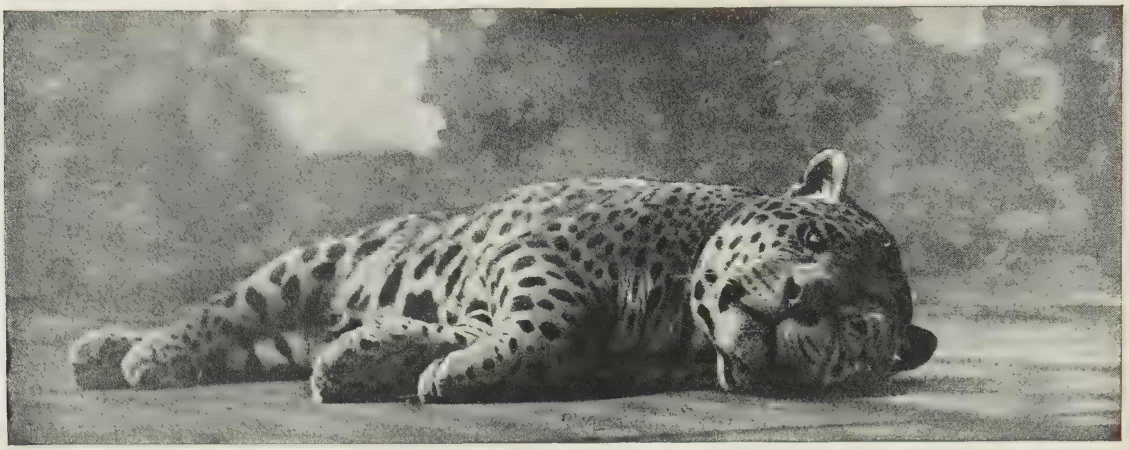


Photo by G. W. Wilson & Co., Ltd.] [*Aberdeen*

JAGUAR

The largest and strongest of the Cats of America. A South American species

THE AMERICAN CATS

THE cats, great and small, of the New World resemble those of the Old, though not quite so closely as the caribou, wapiti deer, and moose of the northern forests resemble the reindeer, red deer, and elk of Europe. They are like, but with a difference. The Jaguar and the Ocelot are respectively larger and far more beautiful than their counterparts, the leopard and serval cats. But the Puma, the one medium-sized feline animal which is unspotted, is something unique. The jaguar and puma are found very far south in South America; and though the jaguar is really a forest animal, it seems to have wandered out on to the Pampas of Argentina, perhaps attracted by the immense numbers of cattle, sheep, and horses on these plains.

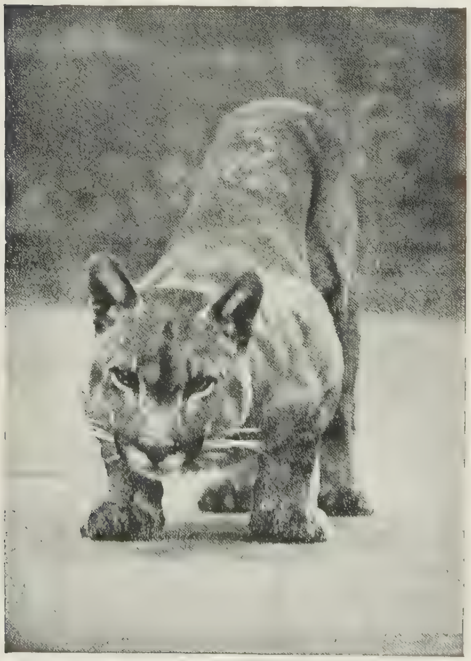


Photo by Scholastic Photo. Co., Parson's Green

PUMA

A puma in the act of lying down, like a domestic cat

THE JAGUAR

The JAGUAR is as savage as it is formidable, but does not often attack men. Its headquarters are the immense forests running from Central America to Southern Brazil; and as all great forests are little inhabited, the jaguar is seldom encountered by white men. By the banks of the great rivers it is semi-aquatic; it swims and climbs with equal ease, and will attack animals on board boats anchored in the rivers. As there are few animals of great size in these forests, its great strength is not often seen exercised, as is that of the lion; but it is the personification of concentrated force, and its appearance is well worth studying from that point of view. The spots are larger and squarer than in the leopard, the head ponderous, the forearms and feet one mass of muscle, knotted under the velvet skin. On the Amazons it draws its food alike from the highest tree-tops and the river-bed; in the former it catches monkeys in the branches, fish in the shallows of the rivers, and scoops out turtles' eggs from the sand banks. Humboldt, who visited these regions when the white population was scarce, declared that 4,000 jaguars were killed annually, and 2,000 skins exported from Buenos Ayres alone. It was clearly common on the Pampas in his day, and made as great havoc among the cattle and horses as it does to-day.

THE PUMA

The PUMA is a far more interesting creature. It is found from the mountains in Montana, next the Canadian boundary, to the south of Patagonia. Many stories of its ferocity may have some foundation; but the writer believes there is no recorded instance of the northern puma attacking man unprovoked, though in the few places where it now survives it kills cattle-calves and colts. It is relentlessly hunted with dogs, treed, and shot. As to the puma of the southern plains and central forests, the natives, whether Indians or Gauchos, agree with the belief, steadily handed down from the days of the first Spanish conquest, that the puma is the one wild cat which is naturally friendly to man. The old Spaniards called it *amigo del Cristiano* (the Christian's friend); and Mr. Hudson, in "The Naturalist in La Plata," gives much evidence of this most curious and interesting tendency: "It is notorious that where the puma is the only large beast of prey it is perfectly safe for a small child to go out and sleep on the plain. . . . The puma is always at heart a kitten, taking unmeasured delight in its frolics; and when, as often happens, one lives alone in the desert, it will amuse itself for hours fighting mock battles or playing hide-and-seek with imaginary companions, or lying in wait and putting all its wonderful strategy in practice to capture a passing butterfly." From Azara downwards these stories have been told too often not to be largely true; and in old natural histories, whose

Photo by Ottomar Anschütz] [*Berlin*

FEMALE PUMA

This shows a puma alert and vigilant, with ears pricked forward

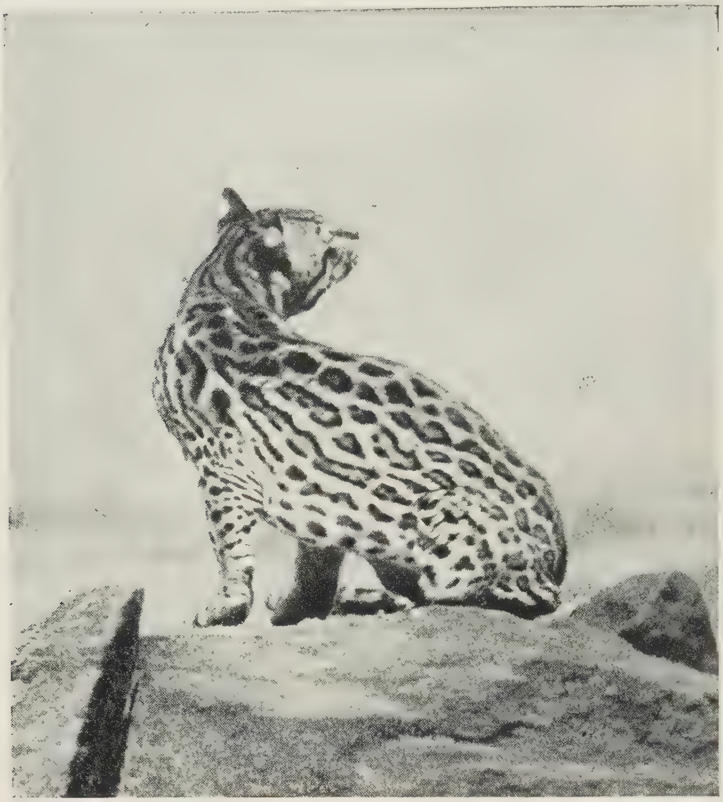


Photo by Ottomar Anschütz] [Berlin

OCELOT

Note the elongated spots, and their arrangement in chains

writers believed the puma was a terrible man-eater, they also appear as "wonderful escapes." One tells how a man put his *poncho*, or cloak, over his back when crawling up to get a shot at some duck, and felt something heavy on the end of it. He crept from under it, and there was a puma sitting on it, which did not offer to hurt him.

As space forbids further quotation from Mr. Hudson's experiences, which should be read, the writer will only add one anecdote which was told him by Mr. Everard im Thurn, C. B., formerly an official in British Guiana. He was going up one of the big rivers in his steam-launch, and gave a passage to an elderly and respectable Cornish miner, who wanted to go up to a gold-mine. The visitor had his meals on the boat, but at night went ashore with the men and slung his hammock between two trees, leaving the cabin to his host. One morning two of the Indian crew brought the miner's hammock on board with a good deal of laughing and talking. Their master asked what the joke was, whereupon, pointing to the trees whence they had unslung the hammock, one said, "Tiger sleep with old man last night." They were quite in earnest, and pointed out a hollow and marks on the leaves, which showed that a puma had been lying *just under the man's hammock*. When asked if he had noticed anything in the night, he said, "Only the frogs croaking wakened me up." The croaking of the frogs was probably the hoarse purring of the friendly puma enjoying his proximity to a sleeping man. Mr. Hudson quotes a case in which four pumas played round and leapt over a person camping out on the Pampas. He watched them for some time, and then went to sleep! Many of those brought to this country come with their tempers ruined by ill-treatment and hardship; but a large proportion are as tame as cats. Captain Marshall had one at Marlow which used to follow him on a chain and watch the boats full of pleasure-seekers at the lock.

The puma is always a beautiful creature,—the fur cinnamon-coloured, tinged with gold; the belly and chest white; the tail long, full, and round. Though friendly to man, it is a desperate cattle-killer, and particularly fond of horse-flesh, so much so that it has been suggested that the indigenous wild horses of America were destroyed by the puma.

There are two other cats of the Pampas—the GRASS-CAT, not unlike our wild cat in appearance and habits, and the WOOD-CAT, or Geoffroy's Cat. It is a tabby, and a most elegant creature, of which there is a specimen, at the time of writing, in the Zoo.

THE OCELOT

In the forest region is also found the most beautiful of the medium-sized cats. This is the

Ocelot, which corresponds somewhat to the servals, but is not the least like a lynx, as the servals are. It is entirely a tree-cat, and lives on birds and monkeys. The following detailed description of its coloration appeared in "Life at the Zoo":—

"Its coat, with the exception perhaps of that of the clouded leopard of Sumatra, marks the highest development of ornament among four-footed animals. The Argus pheasant alone seems to offer a parallel to the beauties of the ocelot's fur, especially in the development of the wonderful ocelli, which, though never reaching in the beast the perfect cup-and-ball ornament seen on the wings of the bird, can be traced in all the early stages of spots and wavy lines, so far as the irregular shell-shaped rim and dot on the feet, sides, and back, just as in the subsidiary ornament of the Argus pheasant's feathers. Most of the ground-tint of the fur is smoky-pearl colour, on which the spots develop from mere dots on the legs and speckles on the feet and toes to large egg-shaped ocelli on the flanks. There are also two beautiful pearl-coloured spots on the back of each ear, like those which form the common ornaments of the wings of many moths."

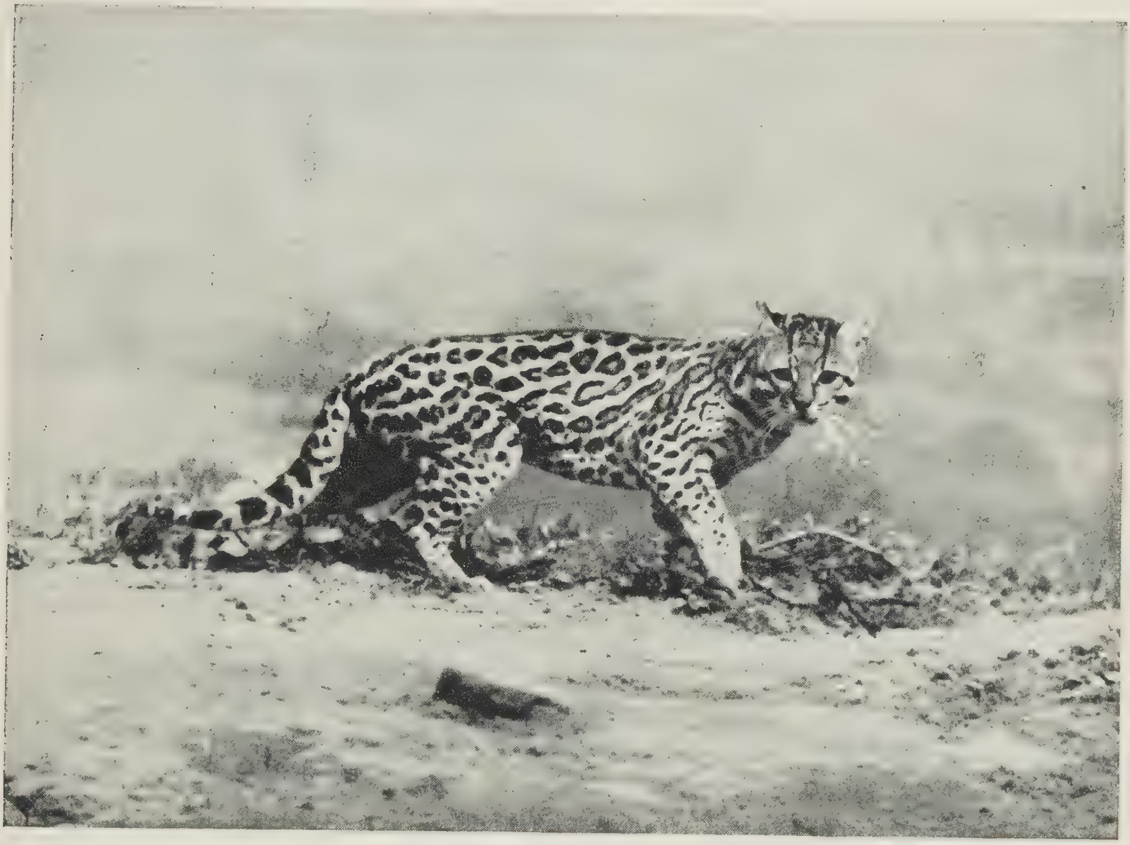


Photo by Ottomar Anschütz] [*Berlin*

OCELOT FROM CENTRAL AMERICA

The ocelot can be tamed and almost domesticated if taken young, and is occasionally kept as a pet by the forest Indians

The nose is pink; the eye large, convex, and translucent.

A tame ocelot described by Wilson, the American naturalist, was most playful and affectionate, but when fed with flesh was less tractable. It jumped on to the back of a horse in the stable, and tried to curl up on its hindquarters. The horse threw the ocelot off and kicked it, curing it of any disposition to ride. On seeing a horse, the ocelot always ran off to its kennel afterwards. When sent to England, it caught hold of and threw down a child of four years old, whom it rolled about with its paws without hurting it.

OTHER WILD CATS

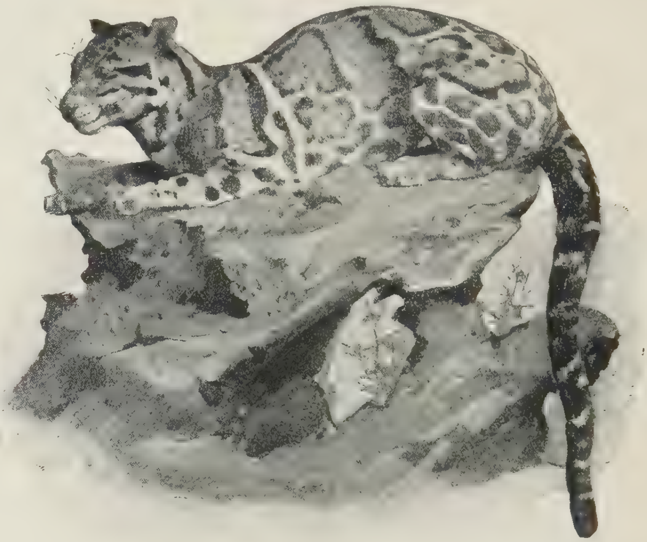


Photo by A. S. Rudland & Sons

CLOUDED LEOPARD

It shares with the ocelot the first place among the highly ornamented cats

A HANDSOME leopard-like animal is the CLOUDED LEOPARD. It is the size of a small common leopard, but far gentler in disposition. Its fur is not spotted, but marked with clouded patches, outlined in gray and olive-brown. Its skin is among the most beautiful of the Cats. It is found in the Malay Peninsula, Borneo, Sumatra, Formosa, and along the foot of the Himalaya from Nepal to Assam. Writing of two which he kept, Sir Stamford Raffles said: "No kitten could be more good-tempered. They were always courting intercourse with persons passing by, and in the expression of their countenance showed the greatest delight when noticed, throwing themselves on their backs, and delighting in being tickled and rubbed. On board ship there was a small dog, which used to play around the cage with the animal. It was amusing to watch the tenderness and playfulness with which the latter came in contact with its smaller-sized companion." Both specimens were procured from the banks of the Bencoolin River, in Sumatra. They are generally found near villages, and are not dreaded by the natives, except in so far that they destroy their poultry.

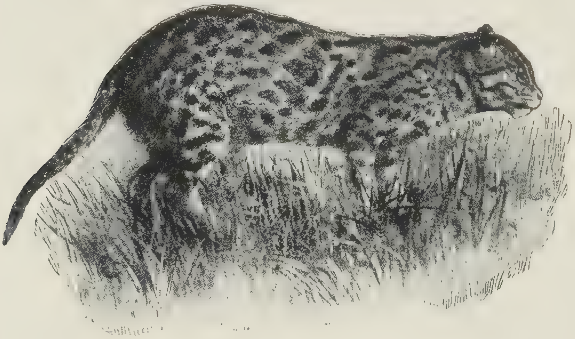


Photo by A. S. Rudland & Sons

FISHING-CAT

This wild cat haunts the sides of rivers, and is an expert at catching fish

The number of smaller leopard-cats and tiger-cats is very great. They fall, roughly, into three groups: those which are yellow and spotted, those which are gray and spotted, and those which are gray and striped, or "whole-coloured." There is no wholly gray wild cat, but several sandy-coloured species. All live on birds and small mammals, and probably most share the tame cat's liking for fish. Among the gray-and-spotted cats are the MOTTLED CAT of the Eastern Himalaya and Straits Settlements and islands; the TIBETAN TIGER-CAT; the FISHING-CAT of India and Ceylon, which is large enough to kill lambs, but lives much on fish and large marsh-snails; GEOFFROY'S CAT, an American species; the LEOPARD-CAT of Java and Japan, which seems to have gray fur in

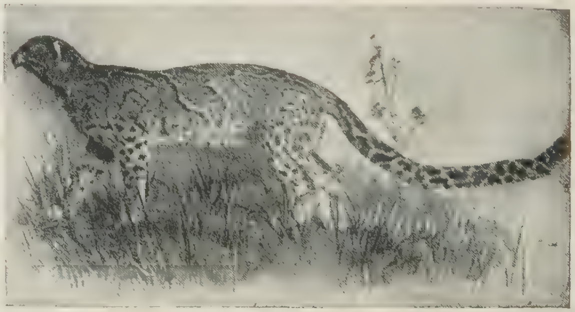


Photo by A. S. Rudland & Sons

MARBLED CAT

Another beautifully marked cat. The tail is spotted and very long, the marbled markings being on the body only

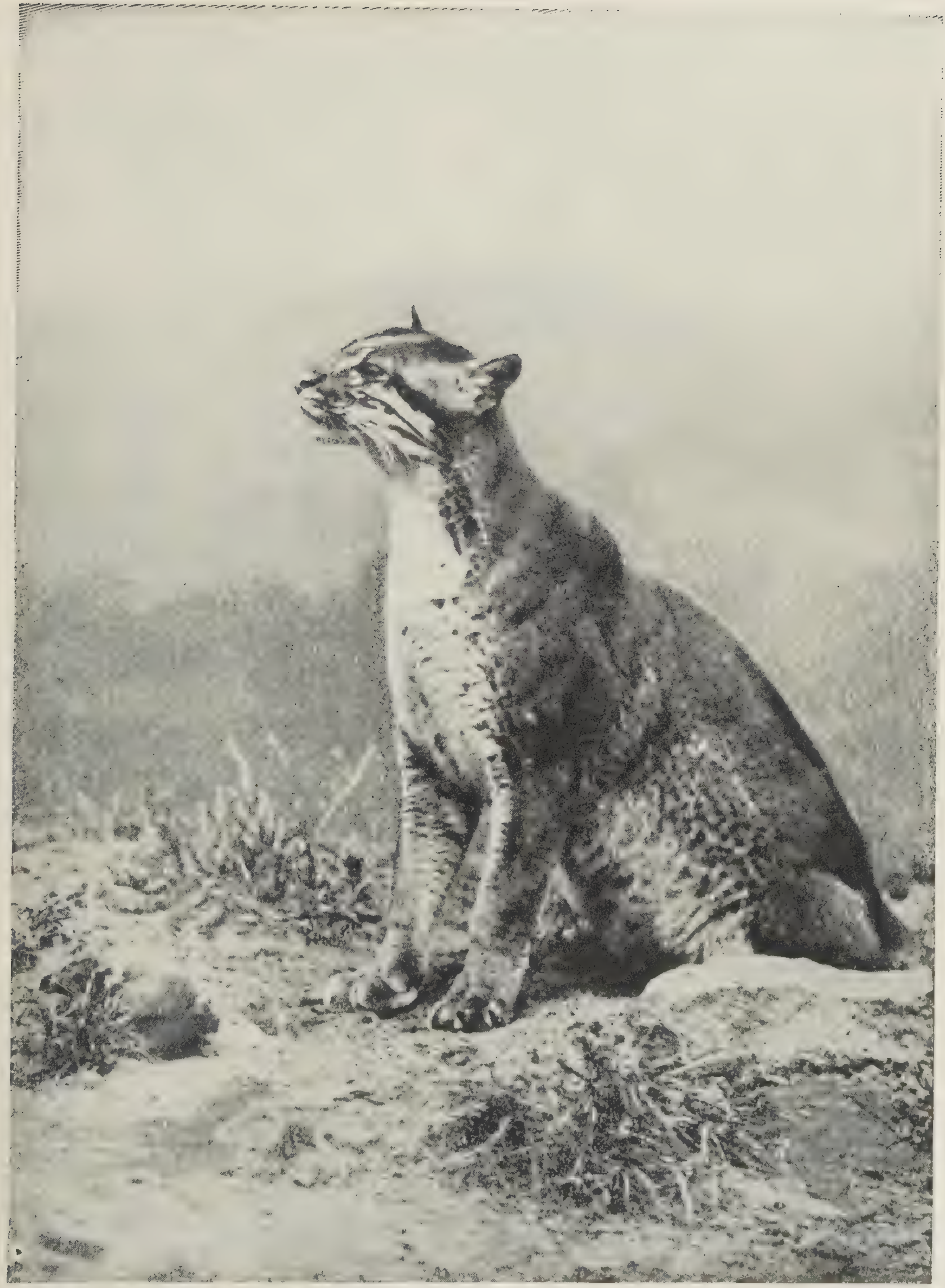


Photo by Ottomar Anschütz] *[Berlin*

GOLDEN CAT

Sumatra is the home of this very beautifully coloured cat. The general tint is that of gold-stone Sometimes the belly is pure white

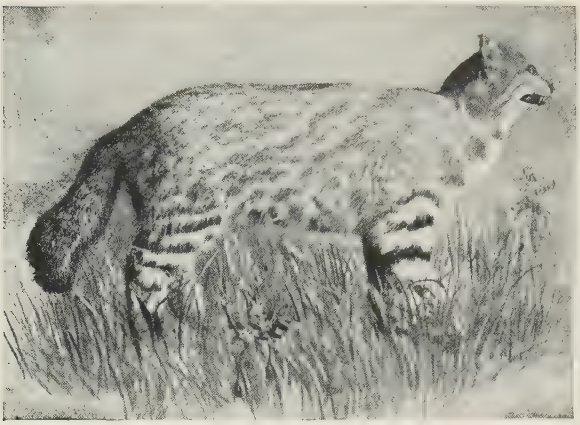


Photo by A. S. Rudland & Sons

PAMPAS-CAT

Note the likeness of the thick tail and barred legs to the English wild cat. "Inexpressibly savage in disposition" (Hudson)

Japan and a fulvous leopard-like skin in India, where it is also called the Tiger-cat; and the smallest of all wild cats, the little Rusty-spotted Cat of India. This has rusty spots on a gray ground. "I had a kitten brought to me," says Dr. Jerdon of the species, "when very young. It became quite tame, and was the delight and admiration of all who saw it. When it was about eight months old, I introduced the fawn of a gazelle into the room where it was. The little creature flew at it the moment it saw it, seized it by the nape of the neck, and was with difficulty taken off." Of the whole-coloured wild cats—which include the Bay Cat, the American Pampas-cat, Pallas' Cat of Tibet and India—the most beautiful is the Golden Cat of Sumatra, one of which is now in the Zoological Gardens. It has a coat the colour of gold-stone. The nose is pink, the eyes large and topaz-coloured, the cheeks striped with white, and the underparts and lower part of the tail pure white.

Four kinds of wild cats are known in South Africa, of which the largest is the Serval, a short-tailed, spotted animal, with rather more woolly fur than the leopard's. The length is about 4 feet 2 inches, of which the tail is only 12 inches. It is found from Algeria to the Cape; but its favourite haunts, like those of all the wild cats of hot countries, are in the reeds by rivers. It kills hares, rats, birds, and small mammals generally.

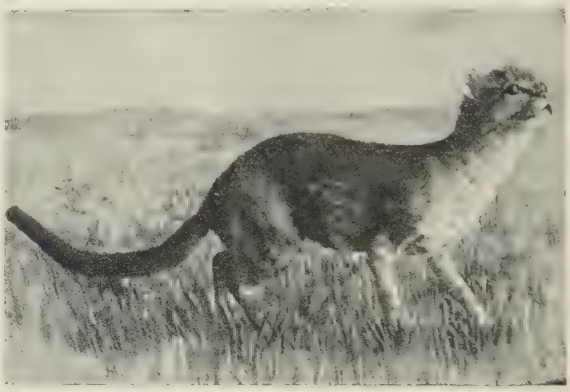


Photo by A. S. Rudland & Sons

EYRA CAT

The lowest and longest of the cats, shaped more like a civet; it is readily tamed, and makes a charming pet

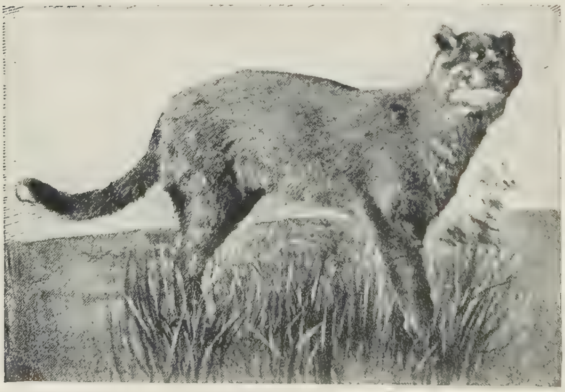


Photo by A. S. Rudland & Sons

BAY CAT

The Black-footed Wild Cat is another African species. It is a beautiful spotted-and-lined tabby, the size of a small domestic cat, and as likely as any other to be the origin of our tabby variety, if tame cats came to Europe from Africa. At present it is only found south in the Kalahari Desert and Bechuanaland.

The Kaffir Cat is the common wild cat of the Cape Colony, and a very interesting animal. It is a whole-coloured tawny, upstanding animal, with all the indifference to man and generally independent character of the domestic tom-cat.

Photo by A. S. Rudland & Sons

KAFFIR CAT

The common wild cat of South Africa. It will interbreed with domestic cats

It is, however, much stronger than the tame cats, with which it interbreeds freely. In the Colony it is often difficult to keep male tame cats, for the wild Kaffir cats come down and fight them in the breeding-season. The Egyptian cat is really the same animal, slightly modified by climate. A very distinct species is the JUNGLE-CAT, ranging from India, through Baluchistan, Syria, and East Africa, and called in Hindustani the CHAUS. The European striped wild cat extends to the Himalaya, where the range of the lion-coloured, yellow-eyed chaus begins. The chaus has a few black bars inside the legs, which vary in different regions. The Indian chaus has only one distinctly marked; the Kaffir cat has four or five. The EGYPTIAN FETTERED CAT has been said to be the origin of the domestic and sacred cats of Egypt. A male chaus is most formidable when "cornered." General Hamilton chased one, which had prowled into the cantonments on the lookout for fowls, into a fence. "After a long time I spied the cat squatting in a hedge," he writes, "and called for the dogs. When they came, I knelt down and began clapping my hands and cheering them on. The cat suddenly made a clean spring at my face. I had just time to catch it as one would a cricket-ball, and, giving its ribs a strong squeeze, threw it to the dogs; but not before it had made its teeth meet in my arm just above the wrist. For some weeks I had to carry my arm in a sling, and I shall carry the marks of the bite to my grave."

The chaus, as will be seen from the above, wanders boldly down into the outskirts of large towns, cantonments, and bungalows, on the lookout for chickens and pigeons. Its favourite plan is to lie up at dawn in some piece of thick cover near to where the poultry wander out to scratch, feed, and bask. It then pounces on the nearest unhappy hen and rushes off with it into cover. An acquaintance of the writer once had a number of fine Indian game fowl, of which he was not a little proud. He noticed that one was missing every morning for three days, and, not being able to discover the robber, shut them up in a hen-house. Next morning he heard a great commotion outside, and one of his bearers came running in to say that a leopard was in the hen-house. As this was only built of bamboo or some such light material, it did not seem probable that a leopard would stay there. Getting his rifle, he went out into the compound, and cautiously approached the hen-house, in which the fowls were still making loud protests and cries of alarm. The door was shut; but some creature—certainly not a leopard—might have squeezed in through the small entrance used by the hens. He opened the door, and saw at the back of the hen-house a chaus sitting, with all its fur on end, looking almost as large as a small leopard. On the floor was one dead fowl. The impudent jungle-cat rushed for the door, but had the coolness to seize the hen

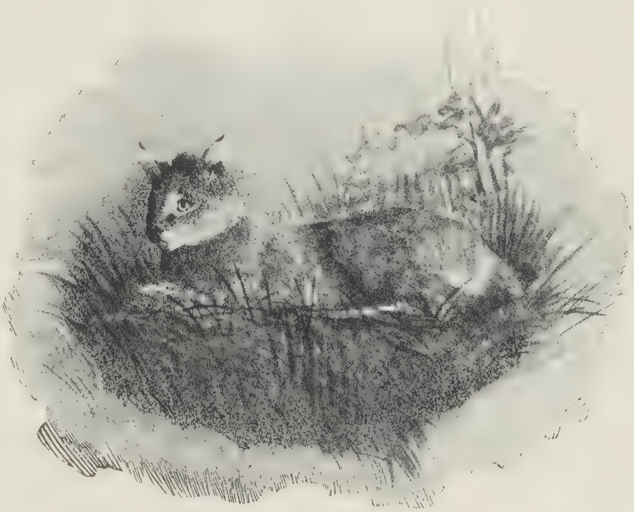


Photo by A. S. Rudland & Sons

AFRICAN CHAUS, OR JUNGLE-CAT

The chaus is the Indian and African equivalent of our wild cat. It is equally strong and savage as it passed, and with this in its mouth rushed past the owner of the hens, his servants and retainers, and reached a piece of thick scrub near with its prize.

As the chaus is common both in India and Africa, a comparison of its habits in both continents is somewhat interesting. Jerdon, the Indian naturalist, writes: "It is the common wild cat from the Himalaya to Cape Comorin, and from the level of the sea to 7,000 or 8,000 feet elevation. It frequents alike the jungles and the open country, and is very partial to long reeds, and grass, sugarcane-fields, and corn-fields. It does much damage to all game, especially to hares and partridges. Quite recently I shot a pea-fowl at the edge of a sugarcane-field. One of these cats sprang out, seized the pea-fowl, and after a short struggle—for the bird was not quite dead—carried it off before my astonished eyes, and, in spite of my running up, made his escape with his booty. It must have been stalking these very birds, so closely did its spring follow my shot. It is said to breed twice a year, and to have three or four young at a birth. I have very often had the young brought to me, but always failed in rearing them; and they always showed a savage and untamable disposition. I have seen numbers of cats about villages in various parts of the country that must have been hybrids between this cat and the tame ones."

The late Sir Oliver St. John was more fortunate with his jungle-cat kittens. He obtained three in Persia. These he reared till they were three months old, by which time they became so tame that they would climb on to his knees at breakfast-time, and behave like ordinary kittens. One was killed by a greyhound, and another by a scorpion—a curious fate for a kitten to meet. The survivor then became morose and ill-tempered, but grew to be a large and strong animal. "Two English bull-terriers of mine, which would make short work of the largest domestic cat, could do nothing against my wild cat," says the same writer. "In their almost daily battles the dogs always got the worst of it."

In Africa the chaus haunts the thick cover bordering the rivers. There it catches not only water-fowl, but also fish. According to Messrs. Nicolls and Eglington, "its spoor may constantly be seen imprinted on the mud surrounding such pools in the periodical watercourses as are constantly being dried up, and in which fish may probably be imprisoned without chance of escape." The chaus has for neighbour in Africa the beautiful SERVAL, a larger wild cat. This species is reddish in colour, spotted on the body, and striped on the legs. The ears are long, but not tufted, like those of the lynx. The serval is more common in North and Central Africa than in the South. But it is also found south of the Tropic of Capricorn. Messrs. Nicolls and Eglington say of it: "Northward through South Central Africa it is fairly common. It frequents the thick bush in the vicinity of rivers. The *karosses*, or mantles, made from its skins are only worn by the chiefs and very high dignitaries amongst the native tribes, and are in consequence eagerly sought after, on which account the species runs a risk of rapid extermination. Its usual prey consists of the young of the smaller antelopes francolins, and wild guinea-fowls; to the latter of which it is a most destructive enemy in the breeding-season. When obtained young, the serval can be tamed with little trouble; but it is difficult to rear, and always shows a singular and almost unaccountable aversion to black men. Its otherwise even temper is always aroused at the sight of a native.

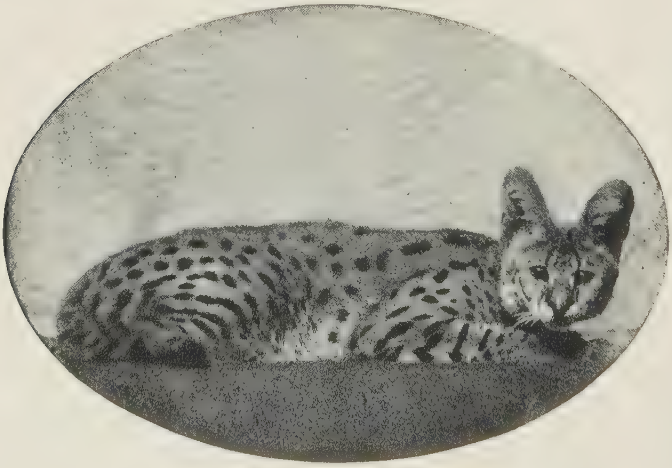


Photo by L. Medland, F.Z.S.] [*North Finchley*

SERVAL

This is a spotted cat, with long ears, but no tufts on them, as in the true lynxes

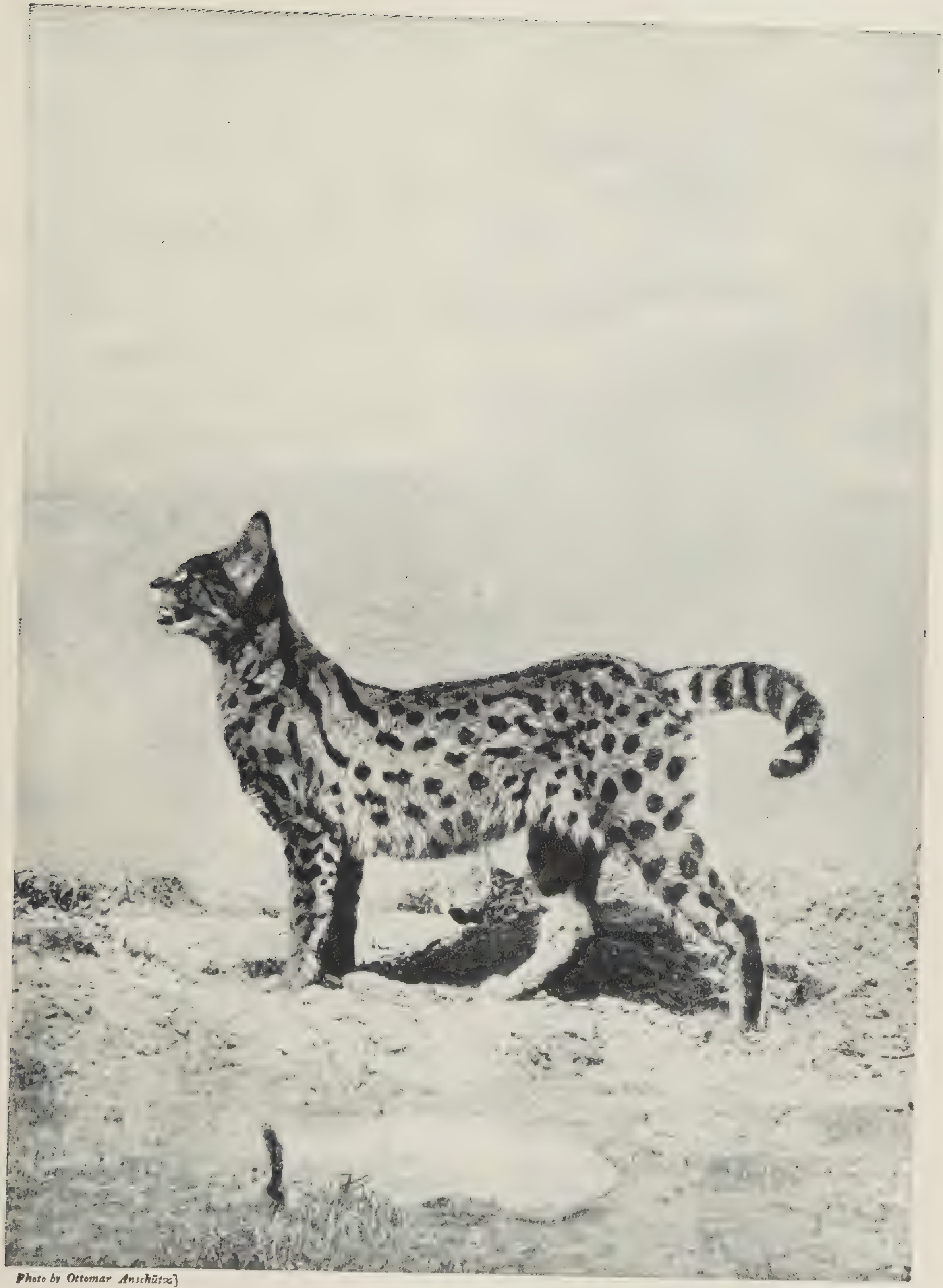


Photo by Ottomar Anschütz] [*Berlin*

MALE SERVAL

The serval is a link between the leopards and tiger-cats, quite large enough to kill the young of the smaller antelopes

When in anger, it is by no means a despicable antagonist, and very few dogs would like to engage in a combat with one single-handed."

THE COMMON WILD CAT

The WILD CAT was once fairly common all over England. A curious story, obviously exaggerated, shows that traditions of its ferocity were common at a very early date. The tale is told of the church of Barnborough, in Yorkshire, between Doncaster and Barnsley. It is said that a man and a wild cat met in a wood near and began to fight; that the cat drove the man out of the wood as far as the church, where he took refuge in the porch; and that both the man and cat were so injured that they died. According to Dr. Pearce, the event was formerly commemorated by a rude painting in the church.

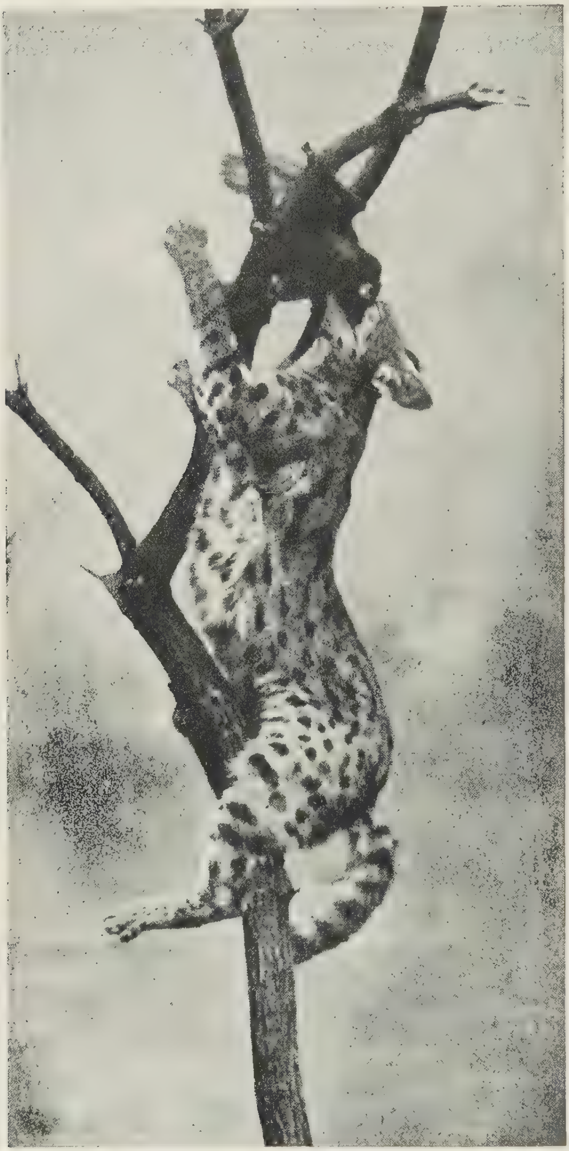


Photo by Ottomar Anschütz] [*Berlin*

SERVAL CLIMBING

Note the active, cat-like method of climbing

Mr. Charles St. John had an experience with a Scotch wild cat very like that which General Douglas Hamilton tells of the jungle-cat. He heard many stories of their attacking and wounding men when trapped or when their escape was cut off, and before long found out that these were true. "I was fishing in a river in Sutherland," he wrote, "and in passing from one pool to another had to climb over some rocky ground. In doing so, I sank almost up to my knees in some rotten heather and moss, almost upon a wild cat which was concealed under it. I was quite as much startled as the cat itself could be, when I saw the wild-looking beast rush so unexpectedly from between my feet, with every hair on her body on end, making her look twice as large as she really was. I had three small Skye terriers with me, which immediately gave chase, and pursued her till she took refuge in a corner of the rocks, where, perched in a kind of recess out of reach of her enemies, she stood with her hair bristled out, spitting and growling like a common cat. Having no weapon with me, I laid down my rod, cut a good-sized stick, and proceeded to dislodge her. As soon as I was within six or seven feet of the place, she sprang straight at my face over the dogs' heads. Had I not struck her in mid-air as she leaped at me, I should probably have received a severe wound. As it was, she fell with her back half broken among the dogs, who with my assistance dispatched her. I never saw an animal fight so desperately, or one which was so difficult to kill. If a tame cat has nine lives, a wild cat must have a dozen. Sometimes one of these animals will take up its residence at no great distance from a house, and, entering the hen-roosts and outbuildings, will carry off fowls in the most audacious manner, or even lambs. Like other vermin, the wild cat haunts the shores of lakes and rivers, and it is therefore easy to know where to set a trap for them. Having caught and killed one of the colony, the rest of them are sure to be taken if the body of their slain relative is left in the same place not far from their usual hunting-ground and surrounded with traps, as every wild cat passing that way will to a certainty come to it."

The wild cat ranges from the far north of Scotland, across Europe and Northern Asia, to the northern slopes of the Himalaya. It has always been known as one of the fiercest and wildest of the cats, large or small. The continual ill-temper of these creatures is remarkable. In the experience of the keepers of menageries there is no other so intractably savage. One presented to the Zoological Gardens by Lord Lilford some eight years ago still snarls and spits at any one who comes near it, even the keeper.

The food of the wild cat is grouse, mountain-hares, rabbits, small birds, and probably fish caught in the shallow waters when chance offers. It is wholly nocturnal; consequently no one ever sees it hunting for prey. Though it has long been confined to the north and northwest of Scotland, it is by no means on the verge of extinction. The deer-forests are saving it to some extent, as they did the golden eagle. Grouse and hares are rather in the way when deer are being stalked; consequently the wild cat and the eagle are not trapped or shot. The limits of its present fastnesses were recently fixed by careful Scotch naturalists at the line of the Caledonian Canal. Mr. Harvie Brown, in 1880, said that it only survived in Scotland north of a line running from Oban to the junction of the three counties of Perth, Forfar, and Aberdeen, and thence through Banffshire to Inverness. But the conclusion of a writer in the *Edinburgh Review* of July, 1898, in a very interesting article on the survival of British mammals, has been happily contradicted. He believed that it only survived in the deer-forests of Inverness and Sutherlandshire. The wild cats shown in the illustrations of these pages were caught a year later as far south as Argyllshire. The father and two kittens were all secured, practically unhurt, and purchased by Mr. Percy Leigh Pemberton for his collection of British mammals at Ashford, in Kent. This gentleman has had great success in preserving his wild cats. They, as well as others—martens, polecats, and other small carnivora—are fed on fresh wild rabbits killed in a warren near; consequently they are in splendid condition. The old "tom" wild cat, snarling with characteristic ill-humour, was well supported by the wild and savage little kittens, which exhibited all the family temper. Shortly before the capture of these wild cats another

By permission of Percy Leigh Pemberton, Esq.

EUROPEAN WILD CAT

The British representative of this species is rapidly becoming extinct. The specimen whose portrait is given here was caught in Argyllshire

5

By permission of Percy Leigh Pemberton, Esq.

SCOTCH WILD CATS

These wild cats, the property of Mr. P. Leigh Pemberton, though regularly fed and well treated, show their natural bad-temper in their faces

family were trapped in Aberdeenshire and brought to the Zoological Gardens. Four kittens beautiful little savages, with bright green eyes, and uninjured, were safely taken to Regent's Park. But the quarters given them were very small and cold, and they all died. Two other full-grown wild cats brought there a few years earlier were so dreadfully injured by the abominable steel traps in which they were caught that they both died of blood-poisoning.

The real wild cats differ in their markings on the body, some being more clearly striped, while others are only brindled. But they are all alike in the squareness and thickness of head and body, and in the short tail, ringed with black, and growing larger at the tip, which ends off like a shaving-brush.

It may well be asked, Which of the many species of wild cats mentioned above is the ancestor of our domestic cats? Probably different species in different countries. The African Kaffir cat, the Indian leopard-cat, the rusty-spotted cat of India, and the European wild cat all breed with tame cats. It is therefore probable that the spotted, striped, and brindled varieties of tame cats are descended from wild species which had those markings. The so-called red tame cats are doubtless descended from the tiger-coloured wild cats. But it is a curious fact that, though the spotted gray-tabby wild varieties are the least common, that colour is most frequent in the tame species.

THE LYNXES

In the Lynxes we seem to have a less specially cat-like form. They are short-tailed, high in the leg, and broad-faced. Less active than the leopards and tiger-cats, and able to live either in very hot or very cold countries, they are found from the Persian deserts to the far north of Siberia and Canada.

The Caracal is a southern, hot-country lynx. It has a longer tail than the others, but the same tufted ears. It seems a link between the lynxes and the jungle-cats. It is found in India, Palestine, Persia, and Mesopotamia. In India it was trained, like the cheeta, to catch birds, gazelles, and hares. The Common Lynx is probably the same animal, whether found in Norway, Russia, the Carpathians, Turkestan, China, or Tibet. The Canadian Lynx is also very probably the same, with local differences of colour. The Northern Lynx is the largest feline animal left in Europe, and kills sheep and goats equally with hares and squirrels. The beautiful fur, of pale cinnamon and light gray, is much admired. In some southern districts of America we have the Red Lynx, or so-called "wild cat," which is distinct from the lynx of Canada. The Mediterranean or Spanish Lynx seems likewise entitled to rank as a distinct species.

Of the lynxes the Caracals are perhaps the most interesting, from their capacity for domestication. They are found in Africa in the open desert country, whereas the Serval is found in the thick bush. In Africa it is believed to be the most savage and untamable of the Cats. That is probably because the Negro and the Kaffir never possessed the art of training animals, from the elephant downwards. In India the caracal's natural prey are the fawns of deer and antelope, pea-fowl, hares, and floricans. The caracal is the quickest with its feet of any of the Cats. One of its best-known feats is to spring up and catch birds passing over on the wing at a height of six or eight feet from the ground. A writer, in the Naturalist's Library, notes that, besides being tamed to catch deer, pea-fowl, and cranes, the caracal was used in "pigeon matches." Two caracals were backed one against the other to kill pigeons. The birds were fed on the ground, and the caracals suddenly let loose among them, to strike down as many as each could before the birds escaped. Each would sometimes strike down with its forepaws ten or a dozen pigeons. "Caracal" means in Turkish "Black Ear," in allusion to the colour of the animal's organ of hearing.

The Common Lynx is a thick-set animal, high in the leg, with a square head and very strong paws and forearms. It is found across the whole northern region of Europe and Asia. Although never known in Britain in historic times, it is still occasionally seen in parts of the Alps and in the Carpathians; it is also common in the Caucasus. It is mainly a forest animal, and very largely nocturnal; therefore it is seldom seen, and not often hunted. If any enemy approaches, the lynx lies perfectly still on some branch or rock, and generally succeeds in avoiding notice. The lynx is extremely active; it can leap great distances, and makes its attack usually

Photo by Ottomar Anschütz] [*Berlin*

LYNX

This animal is a uniformly coloured species common to India and Africa

Photo by A. S. Rudland & Sons

EUROPEAN LYNX

The largest of the cat tribe left in Europe

in that way. When traveling, it trots or gallops in a very dog-like fashion. Where sheep graze at large on mountains, as in the Balkans and in Greece, the lynx is a great enemy of the flocks. In Norway, where the animal is now very rare, there is a tradition that it is more mischievous than the wolf, and a high price is set on its head.

In Siberia and North Russia most of the lynx-skins taken are sold to the Chinese. The lynx-skins brought here are mainly those of the Canadian species. The fur is dyed, and used for the busbies of the officers in the hussar regiments. These skins vary much in colour, and in length and quality of fur. The price varies correspondingly. The Canadian lynx lives mainly on the wood-hares and on the wood-grouse of the North American forests. The flesh of the lynx is said to be good and tender.

Brehm says of the Siberian lynx: "It is a forest animal in the strictest sense of the word. But in Siberia it occurs only singly, and is rarely captured. Its true home is in the thickest parts in the interior of the woods, and these it probably never leaves except when scarcity of food or the calls of love tempt it to wander to the outskirts. Both immigrants and natives hold the hunting of the lynx in high esteem. This proud cat's activity, caution and agility, and powers of defense arouse the enthusiasm of every sportsman, and both skin and flesh are valued, the latter not only by the Mongolian tribes, but also by the Russian hunters. The lynx is seldom captured in fall-traps; he often renders them useless by walking along the beam and stepping on the lever, and he usually leaps over the spring-traps in his path. So only the rifle and dogs are left."

The Red Lynx is a small American variety, the coat of which turns tawny in summer, when it much resembles a large cat. It is called in some parts of the United States the Mountain-cat. This lynx is 30 inches long in the body, with a tail 6 inches long. It is found on the eastern or Atlantic side of the continent, and by no means shuns the neighbourhood of settlements.

By permission of Mr. S. B. Gundy] [Toronto

CANADIAN LYNX

Great numbers of these are trapped every year for the sake of their fur

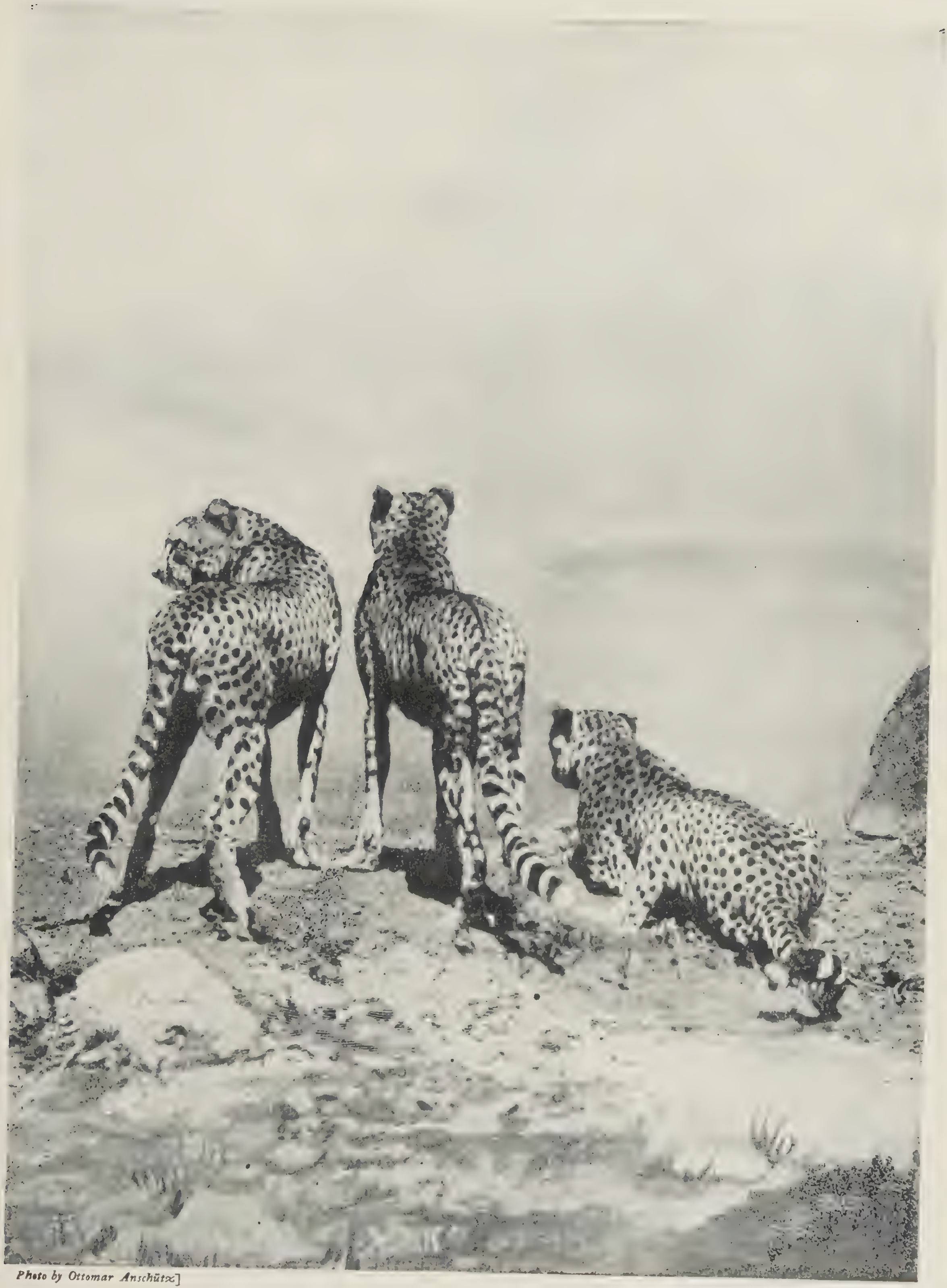


Photo by Ottomar Anschütz] [*Berlin*

CHEETAS

Cheetas can be distinguished at a glance from the ordinary leopards by the solid black spots upon the back instead of the "rosettes."

THE CHEETA

The Non-Retractile-Clawed Cat

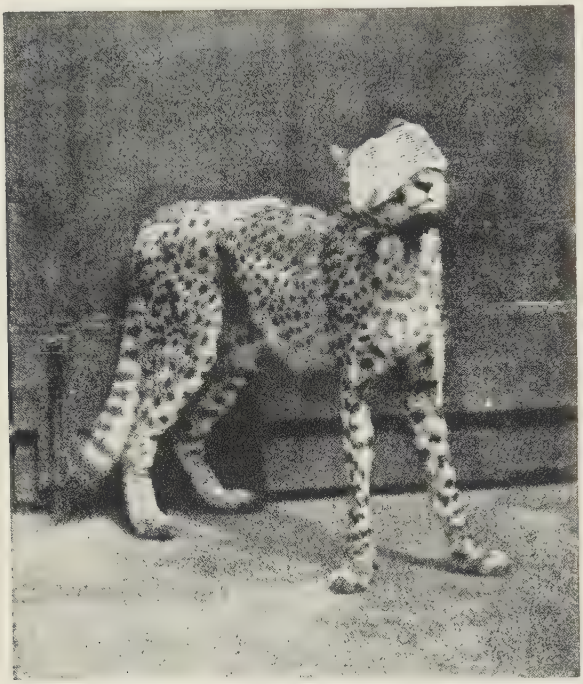


Photo by York & Son] [Notting Hill

A CHEETA HOODED

The cheeta is not unhooded until fairly near his quarry, when he is given a sight of the game, and a splendid race ensues

The Cheeta, or Hunting-leopard, is the only example of this particular group, though there was an extinct form, whose remains are found in the Siwalik Hills, in the north of India. It is a very widely dispersed animal, found in Persia, Turkestan, and the countries east of the Caspian, and in India so far as the lower part of the centre of the peninsula. It is also common in Africa, where until recent years it was found in Cape Colony and Natal. Now it is banished to the Kalahari Desert, the Northern Transvaal, and Bechuanaland.

The cheeta is more dog-like than any other cat. It stands high on the leg, and has a short, rounded head. Its fur is short and rather woolly, its feet rounded, and its claws, instead of slipping back into sheaths like a lion's, are only partly retractile.

Mr. Lockwood Kipling gives the following account of the cheeta and its keepers: "The only point where real skill comes into play in dealing with the hunting-leopard is in catching the adult animal when it has already learnt the swift, bounding onset, its one accomplishment. The young cheeta is not worth catching, for it has not yet learnt its trade, nor can it be taught in captivity. . . . There are certain trees where these great dog-cats (for they have some oddly canine characteristics) come to play and whet their claws. The hunters find such a tree, and arrange nooses of deer-sinew round it, and wait the event. The animal comes and is caught by the leg, and it is at this point that the trouble begins. It is no small achievement for two or three naked, ill-fed men to secure so fierce a capture and carry it home tied on a cart. Then his training begins. He is tied in all directions, principally from a thick rope round his loins, while a hood fitted over his head effectually blinds him. He is fastened on a strong cot-bedstead, and the keepers and their wives and families reduce him to submission by starving him and keeping him awake. His head is made to face the village street, and for an hour at a time, several times a day, his keepers make pretended rushes at him, and wave clothes, staves, and other articles in his face. He is talked to continually, and the women's tongues are believed to be the most effective of things to keep him awake. No created being could withstand the effects of hunger, want of sleep, and feminine scolding; and the poor cheeta becomes piteously, abjectly tame. He is taken out for a walk occasionally—if a slow crawl between four attendants, all holding hard, can be called a walk—and his promenades are always through the crowded streets and bazaars, where the keepers' friends are to be found; but the people are rather pleased than otherwise to see the raja's cheetas amongst them." Later, when the creature is tamed, "the cheeta's bedstead is like that of the keeper, and leopard and man are often curled up under the same blanket! When his bedfellow is restless, the keeper lazily stretches out an arm from his end of the coat and dangles a tassel over the animal's head, which seems to soothe him. In the early morning I have seen a cheeta sitting up on his couch, a red blanket half covering him, and his tasseled red hood awry, looking exactly like an elderly gentleman in a nightcap, as he yawns with the irresolute air of one who is in doubt whether to rise or to turn in for another nap."

This charming and accurate description shows the cheeta at home. In the field he is quite another creature. He is driven as near as possible to the game, and then unhooded and given a sight of them. Sir Samuel Baker thus describes a hunt in which a cheeta was used: "The chase began after the right-hand buck, which had a start of about 110 yards. It was a magnificent sight to see the extraordinary speed of pursuer and pursued. The buck flew over the level surface, followed by the cheeta, which was laying out at full stretch, with its long, thick tail brandishing in the air. They had run 200 yards, when the keeper gave the word, and away we went as fast as our horses could carry us. The horses could go over this clear ground, where no danger of a fall seemed possible. I never saw anything to equal the speed of the buck and the cheeta; we were literally nowhere, although we were going as hard as horse-flesh could carry us; but we had a glorious view. The cheeta was gaining in the course, while the buck was exerting every muscle for life or death in its last race. Presently, after a course of about a quarter of a mile, the buck doubled like a hare, and the cheeta lost ground as it shot ahead, instead of turning quickly, being only about thirty yards in rear of the buck. Recovering itself, it turned on extra steam, and the race appeared to recommence at increased speed. The cheeta was determined to win, and at this moment the buck made another double in the hope of shaking off its terrible pursuer; but this time the cheeta ran cunning, and was aware of the former game. It turned as sharply as the buck. Gathering itself together for a final effort, it shot forward like an arrow, picked up the distance which remained between them, and in a cloud of dust we could for one moment distinguish two forms. The next instant the buck was on its back, and the cheeta's fangs were fixed like an iron vice in its throat. The course run was about 600 yards, and it was worth a special voyage to India to see that hunt."

Photo by Ottomar Anschütz] [*Berlin*

A CHEETA ON THE LOOK-OUT

Cheetas are common to Africa and India. By the native princes of the latter country they are much used for taking antelope and other game

THE DOMESTIC CAT

By Louis Wain

Photo by T. Fall] [Baker Street

WHITE SHORT-HAIRED

Most white cats are not albinoes—that is to say, they have ordinarily coloured and not red eyes

Of the domestication of the cat we know very little, but it is recorded that a tribe of cats was trained to retrieve—*i.e.*, to fetch and carry game. In our own time I have seen many cats fetch and carry corks and newspapers, and on one occasion pounce upon a small roach at the end of a line and place it at its owner's feet. Gamekeepers whom I have known agree that, for cunning, craftiness, and tenacity in attaining an object, the semi-wild cat of the woods shows far superior intelligence to the rest of the woodland denizens. It is quite a usual thing to hear of farm cats entering upon a snake-hunting expedition with the greatest glee, and showing remarkable readiness in pitching upon their quarry and pinning it down until secured. These farm cats are quite a race by themselves. Of decided sporting proclivities, they roam the countryside with considerable fierceness, and yet revert to the domesticity of the farmhouse fireside as though innocent of roving instincts. They are spasmodic to a degree in their mode of life, and apparently work out one mood before entering upon another. It will be remembered that this spasmodic tendency—the true feline independence, by the bye—is and has been characteristic of the cat throughout its history, and any one who has tried to overcome it has met with failure.

Watch your own cat, and you will see that he will change his sleeping-quarters periodically; and if he can find a newspaper conveniently placed, he will prefer it to lie upon, before anything perhaps, except a cane-bottomed chair, to which all cats are very partial. If you keep a number of cats, as I do, you will find that they are very imitative, and what one gets in the habit of doing they will all do in time: for instance, one of my cats took to sitting with his front paws inside my tall hat and his body outside, and this has become a catty fashion in the family, whether the object be a hat, cap, bonnet, small basket, box, or tin. If by chance one of the cats is attacked by a dog, a peculiar cry from the aggrieved animal will immediately awaken the others out of their lethargy or sleep, and bring them fiercely to the rescue. They are, too, particularly kind and nice to the old cat, and are tolerant only of strange baby kittens and very old cats in the garden as long as they do not interfere with the "catty" subject. The same quality obtains in Spain or Portugal, where a race of scavenging cats exists, which go about in droves or families, and are equal to climbing straight walls, big trees, chimneys, and mountainsides. Long, lanky, and thin, they are built more on the lines of a greyhound than the ordinary cat, and are more easily trained in tricks than home cats.

The Tortoiseshell has long been looked upon as the national cat of Spain, and in fact that country is overrun with the breed, ranging from a dense

Photo by T. Fall] [Baker Street

LONG-HAIRED WHITE

White cats with blue eyes are generally deaf, or at all events hard of hearing

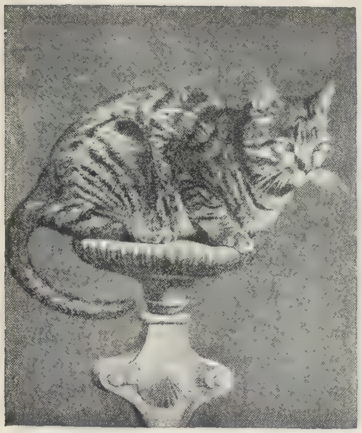


Photo by Fratelli Alinari, Florence

MACKEREL-MARKED TABBY

Tabbies are probably the best known and the commonest cats

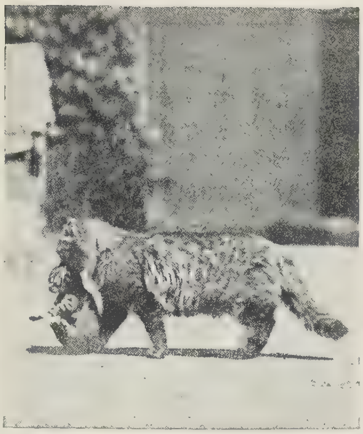


Photo by L. Medland, F.Z.S., North Finchley

CAT CARRYING KITTEN

A unique photograph, showing the way in which the cat carries its young

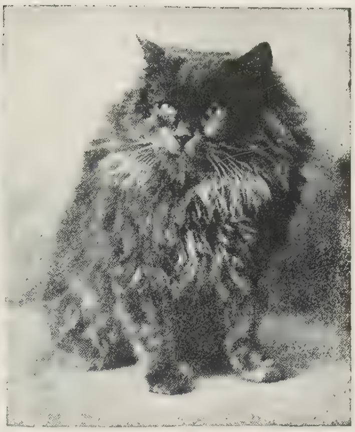
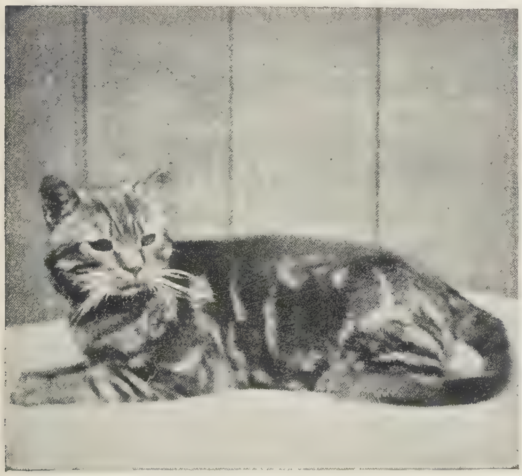


Photo by E. Landor, Ealing

BLUE LONG-HAIRED, OR PERSIAN

Persian or long-haired cats are of various colours; this is one of the least common



By permission of Lady Alexander

ORANGE TABBY

A champion winner of 90 first prizes

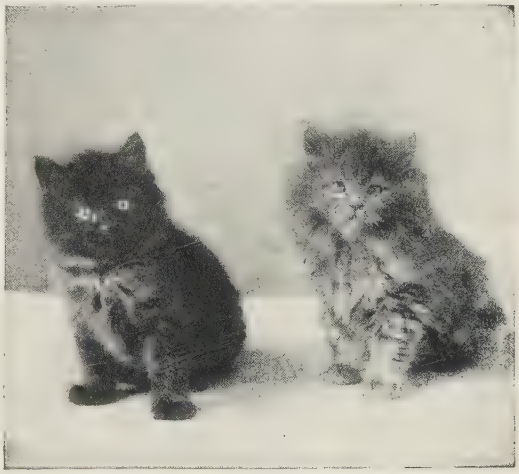


Photo by E. Landor, Ealing

SMOKE AND BLUE LONG-HAIRED

Two pretty and valuable Persian kittens

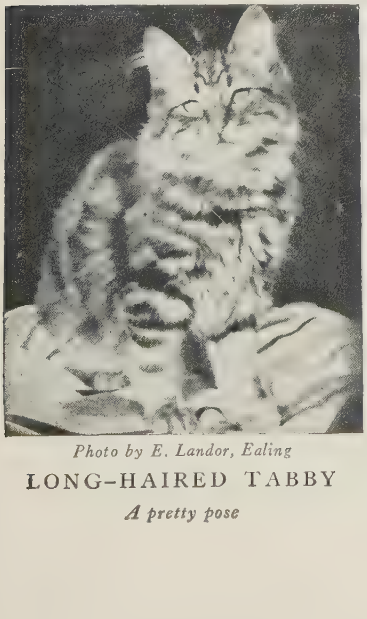


Photo by E. Landor, Ealing

LONG-HAIRED TABBY

A pretty pose

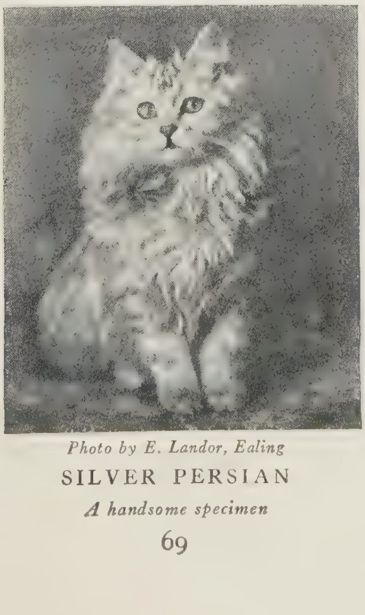


Photo by E. Landor, Ealing

SILVER PERSIAN

A handsome specimen

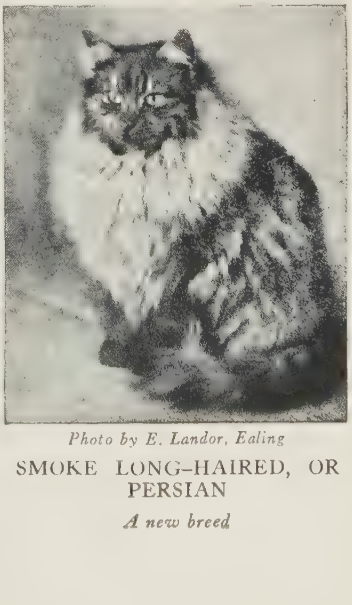


Photo by E. Landor, Ealing

SMOKE LONG-HAIRED, OR PERSIAN

A new breed

black and brown to lighter shades of orange brown and white. The pure tortoiseshell might be called a black and tan, with no white, streaked like a tortoiseshell comb if possible, and with wonderful amber eyes. It is characteristic of their intelligence that they will invariably find their way home, and will even bring that mysterious instinct to bear which guides them back long distances to the place of their birth; and, with regard to this cat, the stories of almost impossible journeys made are not one bit exaggerated. The tom-cats of this breed are very rare in England; I myself have only known of the existence of six in fifteen years, and of these but three are recorded in the catalogues of the cat shows.

SHORT-HAIRED BLUE

This champion cat belongs to Lady Alexander, by whose kind permission it is here reproduced

The Black Cat has many of the characteristics of the tortoiseshell, but is essentially a town cat, and is wont to dream his life away in shady corners, in underground cellars, in theatres, and in all places where he can, in fact, retire to monastic quiet. The black cat of St. Clement Danes Church was one of the remarkable cats of London. It was his wont to climb on to the top of the organ-pipes and enjoy an occasional musical concert alone. A christening or a wedding was his pride; and many people can vouch for a lucky wedding who had the good-fortune to be patronised by the black cat of St. Clement Danes, which walked solemnly down the aisle of the church in front of the happy couples.

My old pet Peter was a black-and-white cat, and, like most of his kind, was one of the most remarkable cats for intelligence I have ever known. A recital of his accomplishments would, however, have very few believers—a fact I find existing in regard to all really intelligent cats. There are so many cats of an opposite character, and people will rarely take more than a momentary trouble to win the finer nature of an animal into existence. Suffice it to say, that Peter would lie and die, sit up with spectacles on his nose and with a post-card between his paws—a trick I have taught many people's cats to do. He would also mew silent meows when bid, and wait at the door for my home-coming. For a long time, too, it was customary to hear weird footfalls at night outside the bedroom doors, and visitors to the house were a little more superstitious as to their cause than we were ourselves. We set a watch upon the supposed ghost, but sudden opening of the doors discovered only the mystic form of Peter sitting purring on the stairs. He was, however, ultimately caught in the act of lifting the corner of the door-rug and letting it fall back in its place, and he had grown quite expert in his method of raising and dropping it at regular intervals until he heard that his signals had produced the required effect, and the door was opened to admit him.

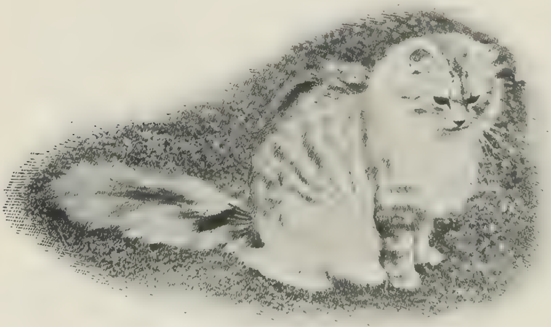


Photo by T. Fall] [*Baker Street*

SILVER TABBY

A beautiful variety of a typical cat

White Cats I might call musical cats, for it is quite characteristic of the albinoes that noises rarely startle them out of their simpering, loving moods. The scraping of a violin, which will scare an ordinary cat out of its senses, or the thumping of a piano, which would terrorise even strong-nerved cats, would only incite a white cat to a happier mood. Certainly all white cats are somewhat deaf, or lack acute quality of senses; but this failing rather softens the feline nature than becomes dominant as a weakness.

Photo by E. Landor] *[Ealing*

SHORT-HAIRED TABBY

This is perhaps the most famous cat now living. It has won no less than 200 prizes

The nearest to perfection perhaps, and yet at the same time extremely soft and finely made, is the Blue Cat, rare in England as an English cat, but common in most other countries, and called in America the Maltese Cat—for fashion's sake probably, since it is too widely distributed there to be localised as of foreign origin. It is out in the mining districts and agricultural quarters, right away from the beaten tracks of humanity, where the most wonderful breeds of cats develop in America; and caravan showmen have told me that at one time it was quite a business for them to carry cats into these wildernesses, and sell them to rough, hardy miners, who dealt out death to each other without hesitation in a quarrel, but who softened to the appeal of an animal which reminded them of homelier times.

One man told me that upon one occasion he sold eight cats at an isolated mining township in Colorado, and some six days' journey farther on he was caught up by a man on horseback from the township, who had ridden hard to overtake the menagerie caravan, with the news that one of the cats had climbed a monster pine-tree, and that all the other cats had followed in his wake; food and drink had been placed in plenty at the foot of the tree, but that the cats had been starving, frightened out of their senses, for three days, and despite all attempts to reach them they had only climbed higher and higher out of reach into the uppermost and most dangerous branches of the pine. The showman hastened with his guide across country to the township, only to find that in the interval one bright specimen of a man belonging to the village had suggested felling the tree and so rescuing the cats from the pangs of absolute starvation, should they survive the ordeal. A dynamite cartridge had been used to blast the roots of the pine, and a rope attached to its trunk had done the rest and brought the monster tree to earth, only, however, at the expense of all the cats, for not one survived the tremendous fall and shaking. A sad and tearful procession followed the remains of the cats to their hastily dug grave, and thereafter a bull mastiff took the place of the cats in the township, an animal more in character with the lives of its inhabitants.

Photo by E. Landor] *[Ealing*

LONG-HAIRED ORANGE

A good specimen of this variety is always large and finely furred

Analogous to this case of the traveling menageries, we have the great variety of blues, silvers, and whites which are characteristic of Russia. There is a vast tableland of many thousands of miles in extent, intersected by caravan routes to all the old countries of the ancients, and it is not astonishing to hear of attempts being made

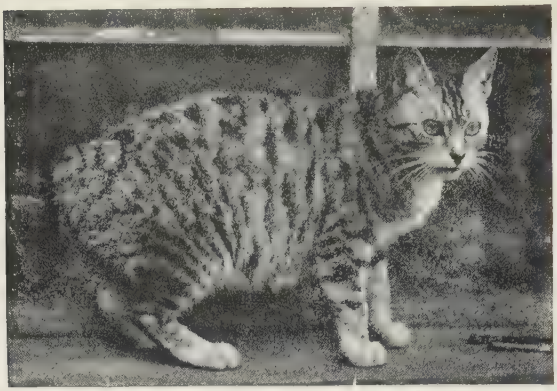


Photo by C. Reid] [*Wishaw, N. B.*

MANX

These tailless cats are well known; they were formerly called "Cornwall cats." Note the length of the hind legs, which is one of the characteristics of this variety of the domestic cat

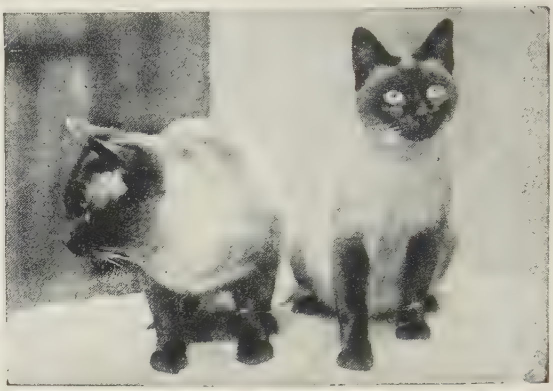


Photo by E. Landor] [*Ealing*

SIAMESE

These strikingly coloured cats are now fairly numerous, but command high prices. They have white kittens, which subsequently become coloured

to steal the wonderful cats of Persia, China, and Northern India, as well as those of the many dependent and independent tribes which bound the Russian kingdom. But it is a remarkable fact that none but the blues can live in the attenuated atmosphere of the higher mountainous districts through which they are taken before arriving in Russian territory. It is no uncommon thing to find a wonderful complexity of blue cats shading to silver and white in most Russian villages, or blue cats of remarkable beauty, but with a dash of tabby-marking running through their coats. Their life, too, is lived at the two extremes. In the short Russian summer they roam the woodlands, pestered by a hundred poisonous insects; in the winter they are imprisoned within the four walls of a snow-covered cottage, and are bound down prisoners to domesticity till the thaw sets in again. Many of the beautiful furs which come to us from Russia are really the skins of these cats, the preparation of which for market has grown into a large and thriving industry. The country about Kronstadt, in the Southern Carpathian Mountains of Austria, is famous for its finely developed animals; and here, too, has grown up a colony of sable-coloured cats, said to be of Turkish origin, where the pariahs take the place of cats.

The Tabby is remarkable to us in that it is characteristic of our own country, and no other colour seems to have been popular until our own times. If you ask any one which breed of cat is the real domestic cat, you will be told the tabby, probably because it is so well known to all. The complexity of the tabby is really remarkable, and for shape and variety of colouring it has no equal in any other tribe of cat. It has comprised in its nature all the really great qualities of the feline, and all its worst attributes. You can truthfully say of one of its

BLUE LONG-HAIRED, OR PERSIAN

This cat belonged to Queen Victoria

SILVER PERSIANS

Three of Mrs. Champion's celebrated cats

Photo by E. Landor] [*Ealing*

LONG-HAIRED CHINCHILLA

Note the beautiful "fluffiness" of this cat's fur

specimens that it attaches itself to the individual, while of another in the same litter you will get an element of wildness. A third of the same parents will sober down to the house, but take only a passing notice of people. You can teach it anything if it is tractable, make it follow like a dog, come to whistle, but it will have its independence.

The SAND-COLOURED CAT, with a whole-coloured coat like the rabbit, which we know as the ABYSSINIAN or BUNNY CAT, is a strong African type. On the Gold Coast it comes down from the inland country with its ears all bitten and torn away in its fights with rivals. It has been acclimatised in England, and Devonshire and Cornwall have both established a new and distinct tribe out of its parentage. The MANX CAT is nearly allied to it, and a hundred years ago the tailless cat was called the Cornwall Cat, not the Manx.

Siam sends us a regal aminal in the SIAMESE ROYAL CAT; it has a brown face, legs, and tail, a cream-coloured body, and mauve or blue eyes. The Siamese take great care of their cats, for it is believed that the souls of the departed are transmitted into the bodies of animals, and the cat is a favourite of their creed; consequently the cats are highly cultivated and intelligent, and can think out ways and means to attain an end.

I have tried for years to trace the origin of the LONG-HAIRED or PERSIAN CATS, but I cannot find that they were known to antiquity, and even the records of later times only mention the SHORT-HAIRED. European literature does not give us an insight into the subject; and unless Chinese history holds some hidden lights in its records, we are thrown back upon the myths of Persia to account for the wonderful modern contribution of the long-haired cat, which is gradually breeding out into as many varieties as the short-haired, with this difference—that greater care and trouble are taken over the long-haired, and they will, as a breed, probably soon surpass the short-haired for intelligence and culture.

One variety is quite new and distinctive—the SMOKE LONG-HAIRED, whose dark brown or black surface-coat, blown aside, shows an under coat of blue and silver, with a light brown frill round its neck. All the other long-haired cats can pair with the short-haired for colouring and marking, but I have not yet seen a BUNNY LONG-HAIRED.

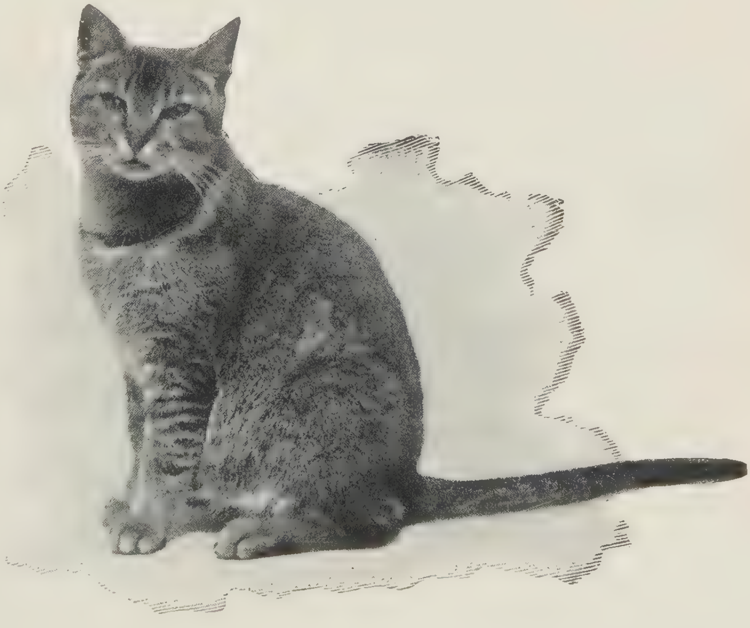


Photo by H. Trevor Jessop

THE "BUN" OR "TICKED" SHORT-HAIRED CAT

This is one of the rarest of cats. It belongs to Miss K. Maud Bennett who has kindly had it photographed for this work

CHAPTER III

THE FOSSA, CIVETS, AND ICHNEUMONS

THE FOSSA

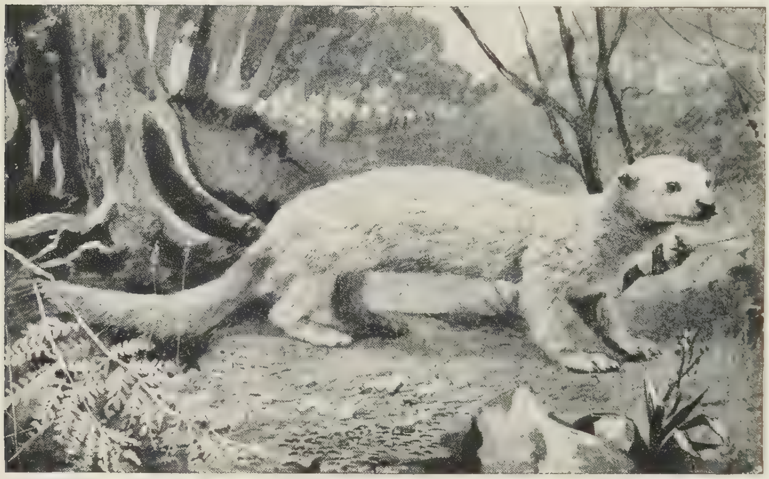


Photo by A. S. Rudland & Sons

FOSSA

The only feline animal of Madagascar

IN the FOSSA Madagascar possesses an altogether peculiar animal. It is a very slender, active creature, with all its proportions much elongated. It is of a bright bay uniform colour, with thick fur, and has sharp retractile claws. It has been described as the natural connecting link between the Civets and the Cats, anatomically speaking. Thus it has retractile claws, but does not walk on its toes, like cats, but on the soles of its feet (the hind pair of which is quite naked), like a civet. Very few have been brought to captivity; indeed, the first time that one was exhibited in the Zoological Gardens was only ten years ago. Formerly stories were told of its ferocity, which was compared to that of the tiger. These tales were naturally the subject of ridicule. The fossa usually attains a length of about 5 feet from snout to tail, and is the largest of the carnivora of Madagascar. A fine young specimen lately brought to London, and in the Zoological Gardens at the time of writing, is now probably full grown. It is about the same length and height as a large ocelot, but with a far longer tail, and is more slenderly built. The extreme activity of the fossa no doubt renders it a very formidable foe to other and weaker creatures. It has been described by a recent writer as being entirely nocturnal, and preying mainly on the lemurs and birds which haunt the forests of Madagascar. The animal kept at the Zoological Gardens has become fairly tame. It is fed mainly on chickens' heads and other refuse from poulterers' shops. Apparently it has no voice of any kind. It neither growls, roars, nor mews, though, when irritated or frightened, it gives a kind of hiss like a cat.

Photo by L. Medland, F.Z.S.] *[North Finchley*

LARGE INDIAN CIVET

Civets are nocturnal in their habits. That shown here has just awakened in broad daylight

THE CIVETS AND GENETS

The Civets are the first marked deviation from the Cat Family. Their bodies are elongated, their legs short, their claws only partially retractile. Some of them have glands holding a strong scent, much esteemed in old days in Europe, when "The Civet Cat" was a common inn-sign even in England. The civets are generally beautifully marked with black stripes and bands on gray. But none of them grow to any large size, and the family has never had the importance of those which contain the large carnivora, like the true cats or bears. Many of the tribe and its connections are domesticated. Some scholars have maintained that the cat of the ancient Greeks was one of then—the common genet. The fact is that both this and the domestic cat were kept by the ancients; and the genet is still used as a cat by the peasants of Greece and Southern Italy.

The African Civet and Indian Civet are large species. The former is common almost throughout Africa. Neither of them seems to climb trees, but they find abundance of food by catching small ground-dwelling animals and birds. They are good swimmers. The Indian civet has a handsome skin, of a beautiful gray ground-colour, with black collar and markings. It is from these civets that the civet-scent is obtained. They are kept in cages for this purpose, and the secretion is scooped from the glands with a wooden spoon. They produce three or four kittens in May or June. Several other species very little differing from these are known as the Malabar, Javan, and Burmese Civets.

The Rasse is smaller, has no erectile crest, and its geographical distribution extends from Africa to the Far East. It is commonly kept as a domestic pet. Like all the civets, it will eat fruit and vegetables.

The Genets, though resembling the civets, have no scent-pouch. They are African creatures, but are found in Italy, Spain, and Greece, and in Palestine, and even in the south of France. Beautifully spotted or striped, they are even longer and lower than the civet-cats, and steal through the grass like weasels.

The Common Genet is black and gray, the latter being the ground-colour. The tail is very long, the length being about 15 inches, while that of the body and head is only 19 inches. Small rodents, snakes, eggs and birds are its principal food. It is kept in Southern Europe for

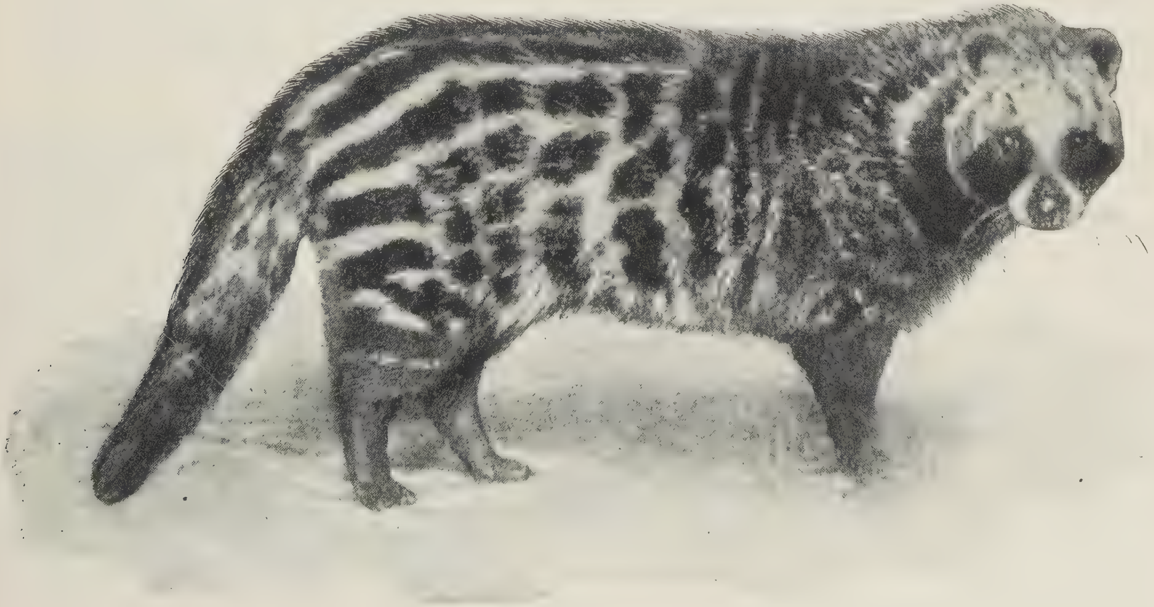


Photo by A. S Rudland & Sons

AFRICAN CIVET

This is one of the largest of the Civet Tribe. The perfume known as "civet" is obtained from it

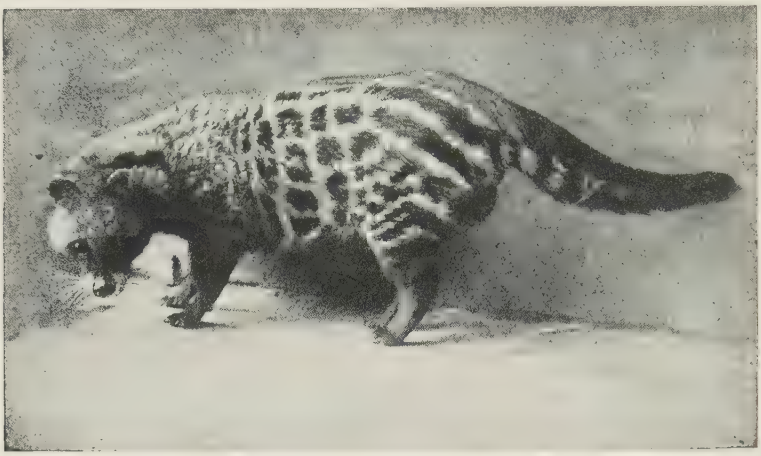


Photo by Scholastic Photo. Co.] *[Parson's Green*

AFRICAN CIVET

This photograph shows the finely marked fur of the species and the front view of the head

killing rats. Several other very similar forms are found in Africa. The presence of such a very Oriental-looking animal in Europe is something of a surprise, though many persons forget that our South European animals are very like those of Africa and the East. The porcupine, which is common in Italy and Spain, and the lynx and Barbary ape are instances. A tame genet kept by an acquaintance of the writer in Italy was absolutely domesticated like a tame mongoose. It had very pretty fur, gray, marbled and spotted with black, and no disagreeable odour, except a scent of musk. It was a most active little creature, full of curiosity, and always anxious to explore not only every room, but every cupboard and drawer in the house. Perhaps this was due to its keenness in hunting mice, a sport of which it never tired. It did not play with the mice when caught as a cat does, but ate them at once.

The LINSANGS, an allied group, are met with in the East, from India to Borneo and Java They are more slender than the genets, and more arboreal. Of the NEPALESE LINSANG Hodgson writes: "This animal is equally at home on trees and on the ground. It breeds and dwells in the hollows of decaying trees. It is not gregarious, and preys mainly on living animals." A tame female owned by him is stated to have been wonderfully docile and tractable, very sensitive to cold, and very fond of being petted. There is an allied West African species.

The PALM-CIVETS and HEMIGALES still further increase this numerous tribe. Slight differences of skull, of the markings of the tail, which may only have rings on the base, and of the foot and tail, are the naturalist's guide to their separation from the other civets; HARDWICKE'S HEMIGALE has more zebra-like markings. Borneo, Africa, India, and the Himalaya all produce these active little carnivora; but the typical palm-civets are Oriental They are sometimes known as Toddy-cats, because they drink the toddy from the jars fastened to catch the juice. The groves of cocoanut-palm are their favourite haunts; but they will make a home in holes in the thatched roofs of houses, and even in the midst of cities. There are many species in the group.

The BINTURONG is another omnivorous, tree-haunting animal allied to the civets; but it has a prehensile tail, which few other mammals of the Old World possess. It is a blunt-nosed, heavy animal, sometimes called the Bear-cat. Very little is known of its habits. It is found from the Eastern Himalaya to Java.

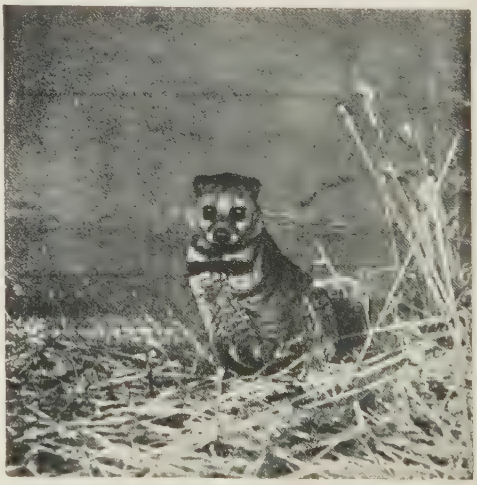


Photo by L. Medland, F.Z.S.] *[North Finchley*

SUMATRAN CIVET

A small and very beautiful member of the Civet Family It feeds largely on fish

The last of the Civet Family is BENNETT'S CIVET, the only instance of a cat-like animal with partly webbed feet. Found in the Malay Peninsula and in

Sumatra and Borneo, it is very rare, but is known to feed on fish and crustacea, and to be semi-aquatic. The author of the chapter on the civets in the Naturalist's Library says, "It may be likened to a climbing otter."

THE MONGOOSE AND ICHNEUMON FAMILY

THESE are a numerous and useful race of small mammals, feeding mainly on the creatures most annoying to man within tropical countries. Snakes, the eggs of the crocodile, large lizard, rats, mice, and other creatures known generally as "vermin," are their favourite food. It must be added that, though they are most useful in destroying these, they also kill all kinds of birds, and that their introduction into some of the West India Islands, for the purpose of killing rats, has been fatal to the indigenous bird life.

THE INDIAN MONGOOSE

This universal favourite is one of the largest, the head and body being from 15 to 18 inches long, and the tail 14 inches. The fur is loose and long, and capable of being erected. As in all the tribe, the tint is a "pepper and salt," the "pepper" colour being sometimes blackish and sometimes red, but a speckled appearance characterises the whole group. This is the animal supposed to be immune from snake-bite. It is possibly so to some extent, for it kills and eats the poisonous snakes, and it is now known that the *eating* of snake-poison tends to give the same protection as inoculation does against certain diseases. But it is certain that in most cases the mongoose, by its activity, and by setting up the hair on its body, which makes the snake "strike short," saves itself from being bitten.

Photo by A. S. Rudland & Sons

GENET

The genets are smaller than some civets, but allied to them. One was anciently domesticated like a cat

Many descriptions of the encounters between these brave little animals and the cobra have been written. Here is one of the less known: "One of our officers had a tame mongoose, a charming little pet. Whenever we could procure a cobra—and we had many opportunities—we used to turn it out in an empty storeroom, which had a window at some height from the ground, so that it was perfectly safe to stand there and look on. The cobra, when dropped from the bag or basket, would wriggle into one of the corners of the room and there coil himself up. The mongoose showed the greatest excitement on being brought to the window, and the moment

Photo by L. Medland, F.Z.S.] *[North Finchley*

TWO-SPOTTED PALM-CIVET

This is a West African species, which, with an allied form from East Africa, represents the palm-civets in the Dark Continent

he was let loose would eagerly jump down into the room, when his behaviour became very curious and interesting. He would instantly see where the snake was, and rounding his back, and making every hair on his body stand out at right angles, which made his body appear twice as large as it really was, he would approach the cobra on tiptoe, making a peculiar humming noise. The snake, in the meantime, would show signs of great anxiety, and I fancy of fear, erecting his head and hood ready to strike when his enemy came near enough. The mongoose kept running backwards and forwards in front of the snake, gradually getting to within what appeared to us to be striking distance. The snake would strike at him repeatedly, and *appeared* to hit him, but the mongoose continued his comic dance, apparently unconcerned. Suddenly, and with a movement so rapid that the eye could not follow it, he would pin the cobra by the back of the head. One could hear the sharp teeth crunch into the skull, and, when all was over, see the mongoose eating the snake's head and part of his body with great gusto. Our little favourite killed a great many cobras, and, so far as I can see, never was bitten.

The Egyptian Mongoose, or Ichneumon, has an equally great reputation for eating the eggs of the crocodile; and the Kaffir Mongoose, a rather larger South African species, is kept as a domestic animal to kill rats, mice, and snakes, of which, like the Indian kind, it is a deadly foe. There are more than twenty other species, most of much the same appearance and habits.

The smooth-nosed mongoose tribe are closely allied creatures in South Africa, mainly burrowing animals, feeding both on flesh and fruit. The Cusimanses of Abyssinia and West Africa are also allied to them. Their habits are identical with the above.

The Meerkats, or Suricates

Most people who have read Frank Buckland's Life will remember the suricate which was his chief pet in Albany Street. The Suricates, or Meerkats, burrow all over the South African veldt, especially in the sandy parts, where they sit up outside their holes like prairie-dogs, and are seen by day. They are sociable animals, and make most amusing pets. A full-grown one is not much larger than a hedgehog, but more slender. It barks like a prairie-dog, and has many other noises of pleasure or anger. A lady, the owner of one, writes in *Country Life:* "It gets on well with the dogs and cats, especially the latter, as they are more friendly to her, and allow her to sleep by their side and on the top of them. One old cat brings small birds

Photo by L. Medland, F.Z.S.] *[North Finchley*

MASKED PALM-CIVET

A whole-coloured species of the group

Photo by Robert D. Carson] [Philadelphia

BINTURONG

The binturong is placed with the civets. It has a prehensile tail like the kinkajou (see page 127)

to her (her favourite is a sparrow), and makes her usual cry, and Janet runs to her and carries off the bird, which she eats, feathers and all, in a very few minutes, if she is hungry." When near a farm, the meerkats will devour eggs and young chickens. They are also said to eat the eggs of the large leopard-tortoise. The commonest is the Slender-tailed Meerkat. It is found all over South Africa, and is very common in the Karroo. It eats insects and grubs as well as small animals, and is commonly kept as a pet throughout the Colony.

We have now traced the long line of the Carnivora from the lordly Lion, the slayer of man and his flocks and herds, and the Tiger, equally formidable and no less specially developed for a life of rapine on a great scale, to creatures as small and insignificant as the Meerkat, which is at least as much an insect-feeder as a devourer of flesh, and the Ichneumons and Civets. The highest form of specialisation in the group is the delicate mechanism by which the chief weapons of offense, the claws, are enabled to keep their razor edge by being drawn up into sheaths when the animal walks, but can be instantly thrust out at pleasure, rigid and sharp as sword-blades. The gradual process by which this equipment deteriorates in the Civets and disappears in the Mongoose should be noted. There are many other carnivora, but none so formidable as those possessing the retractile claws. Thus the Bears, though often larger in bulk than the Lion, are far inferior in the power of inflicting violent injury. At the same time such delicate mechanism is clearly not necessary for the well-being of a species. The members of the Weasel Tribe are quite as well able to take care of themselves as the small cats, though they have non-retractile and not very formidable claws.

Such a very abnornal animal as the Binturong—of which we are able to give an excellent photograph—is doubtless rightly assigned to the place in which modern science has placed it. But it will be found that there are several very anomalous forms quite as detached from any general type as is the binturong. Nature does not make species on any strictly graduated scale. Many of these nondescript animals are so unlike any other group or family that they seem almost freaks of nature. The binturong is certainly one of these.

The next group with which we deal is that of the Hyænas. In these the equipment for catching living prey is very weak. Speed and pursuit are not their *métier*, but the eating of dead and decaying animal matter, and the consumption of bones. Hence the jaws and teeth are highly developed, while the rest of the body is degenerate.

Photo by L. Medland, F.Z.S.] [North Finchley

MONGOOSE

The Indian mongoose is the great enemy of snakes. Another species eats the eggs of the crocodile

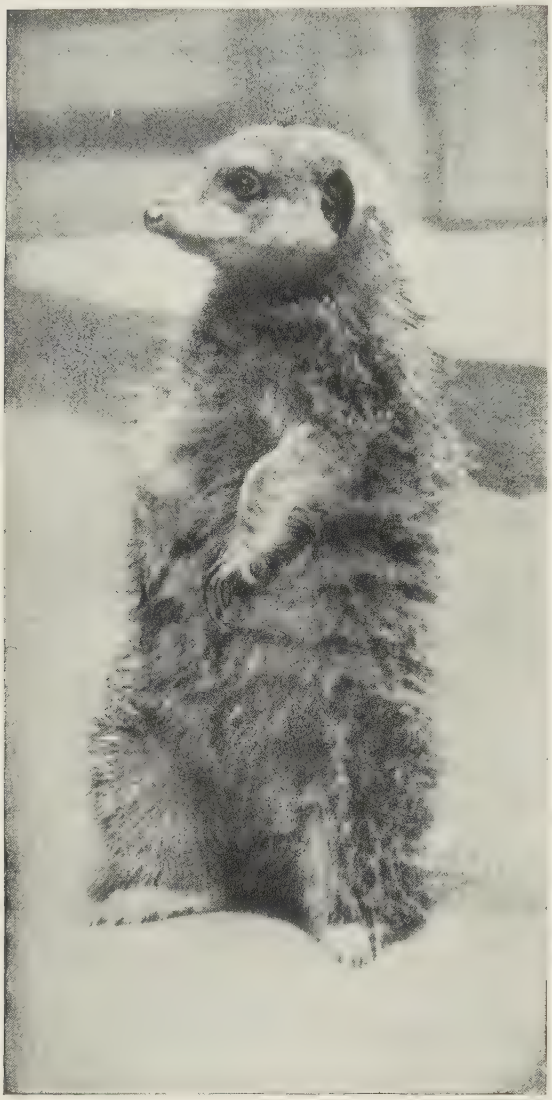


Photo by A. S. Rudland & Sons

MEERKAT

A small, mainly insectivorous animal, found in South Africa; also called the Suricate

The question of the comparative intelligence of the Apes and Monkeys, and the carnivorous animals subsequently described in these pages, is an interesting one. It would seem at first as if the Cat Tribe and their relations, which have to obtain their prey by constant hunting, and often to make use of considerable reflection and thought to bring their enterprises against other animals to a successful issue, would be more likely to develop intelligence and to improve in brain-power than the great Apes, which find an easy living in the tropical forests, and only seek fruits and vegetables for their food. Yet it is quite certain that this is not the case. The Cat Tribe, with the exception of the domesticated cats, does not show high intelligence. Even the latter are seldom trained to obey man, though they learn to accommodate themselves to his ways of life. There is no evidence that cats have any sense of number, or that any of them in a wild state make any effort to provide shelter for themselves or construct a refuge from their enemies, though the Leopard will make use of a cave as a lair. In matters requiring intelligence and cooperation, such rodents as the Beaver, or even the Squirrel, are far beyond the feline carnivora in sagacity and acquired or inherited ingenuity. Except the Stoat, which sometimes hunts in packs, no species of the carnivora yet dealt with in this work combines to hunt its prey, or for defense against enemies. Each for itself is the rule, and even among the less-specialised flesh-eating animals of the other groups it is only the Dog Tribe which seems to understand the principles of association for a common object.

CHAPTER IV

THE HYÆNAS AND AARD-WOLF

IF every animal has its place in nature, we must suppose that the hyæna's business is to clear up the bones and such parts of the animal dead as the vultures and other natural "undertakers" cannot devour. Hyænas have very strong jaws, capable of crushing almost any bone. In prehistoric times they were common in England, and lived in the caves of Derbyshire and Devon. In these caves many bones were found quite smashed up, as if by some very large wild animal. It was supposed that this was done by bears—Dean Buckland said "by hyænas." He procured a hyæna, kept it at his house, and fed it on bones. The smashed fragments he laid on the table at a scientific lecture beside the fragments from the caverns. The resemblance was identical, and the Dean triumphed.

Photo by A. S. Rudland & Sons

SPOTTED HYÆNA

The largest of the carrion-feeding animals. A South African species

The hyænas are carnivorous animals, with the front limbs longer than the hind. The tail is short, the colour spotted or brindled, the teeth and jaws of great strength.

The Brown Hyæna, or Strand-wolf, is an African species, with very long, coarse hair, reaching a length of 10 inches on the back. It is not found north of the Zambesi; and it is nocturnal, and fond of wandering along the shore, where it picks up crabs and dead fish. Young cattle, sheep, and lambs are also killed by it, and offal of all kinds devoured.

The Spotted Hyæna is a large and massive animal, the head and body being 4 feet 6 inches long without the tail. It is found all over Africa from Abyssinia and Senegal southwards. A few are left in Natal. It is believed to be the same as the cave-hyæna of Europe. By day it lives much in the holes of the aard-vark (ant-bear); by night it goes out, sometimes in small bands, to seek food. It has a loud and mournful howl, beginning low and ending high. It also utters a horrible maniacal laugh when excited, which gives it the name of Laughing-hyæna. "Its appetite," says Mr. W. L. Sclater in his "South African Mammals," "is boundless. It is entirely carnivorous, but seems to prefer putrid and decaying matter, and never kills an animal unless driven to do so by hunger. Sheep and donkeys are generally attacked at the belly, and the bowels torn out by its sharp teeth. Horses are also frequent objects of attack; but in this case shackling is useful, as the horse, unable to escape, faces the hyæna, which instantly bolts. It is an excellent scavenger, and it has been known to kill and carry off young children, though the least attempt at pursuit will cause it to drop them. Many stories are told, too, of its attacking sleeping natives; in this case it invariably goes for the man's face. Drummond states that he has seen many men who had been thus mutilated, wanting noses, or with the whole mouth and lips torn away. This is confirmed by other authors." Drummond gives an instance of seven cows being mortally injured in a single night by two hyænas, which attacked them and bit off the udders. Poisoned meat is the only means to get rid of this abominable animal.

Sir Samuel Baker says: "I can safely assert that the bone-cracking power of this animal is extraordinary. I cannot say that it exceeds the lion or tiger in the strength

Photo by A. S. Rudland & Sons

SPOTTED HYÆNA

The jaws of the hyæna are specially made for cracking bones. They will smash the thigh-bone of a buffalo

Photo by L. Medland, F.Z.S.] [*North Finchley*

STRIPED HYÆNA

This is the hyæna of Northern Africa, Palestine, and India

of its jaws; but they will leave bones unbroken which a hyæna will crack in halves. Its powers of digestion are unlimited. It will swallow and digest a knuckle-bone without giving it a crunch, and will crack the thigh-bone of a buffalo to obtain the marrow, and swallow either end immediately after. . . . I remember that once a hyæna came into our tent at night. But this was merely a friendly reconnaissance, to see if any delicacy, such as our shoes, or a saddle, or anything that smelt of leather, were lying about. It was bright moonlight, and the air was calm. There was nothing to disturb the stillness. I was awakened from sleep by a light touch on my sleeve, and my attention was directed by my wife to some object that had just quitted our tent. I took my rifle from beneath the mat on which I lay, and, after waiting for a few minutes sitting up in bed, saw a large form standing in the doorway preparatory to entering. Presently it walked in cautiously, and immediately fell dead, with a bullet between its eyes. It proved to be a very large hyæna, an old and experienced depredator, as it bore countless scars of encounters with other strong biters of its race."

The Striped Hyæna is found in India as well as in Africa. In portions of Abyssinia these animals are so numerous that on the Nile tributaries Sir Samuel Baker used to hear them cracking the bones after supper every night just as they had been thrown by the Arabs within a few feet of the deserted table. In this way they are useful scavengers.

The Aard-wolf

This small African hyæna-like creature stands in a family by itself. The animal is like a small striped hyæna, with a pointed muzzle, longer ears, and a kind of mane. It is common all through South and East Africa, where it lives on carrion, white ants, and lambs and kids. It has not the strong jaws and teeth of the dog or hyæna family. The colonists commonly hunt and kill it with fox-terriers.

Photo by A. S. Rudland & Sons

AARD-WOLF

The aard-wolf stands in a family by itself. It is allied to the hyænas, but is a fr feebler animal

CHAPTER V

THE DOG FAMILY

Photo by Scholastic Photo. Co., Parson's Green

A GROWING CUB

Note how the wolf cub develops the long pasterns, large feet, and long jaw before its body grows in proportion

THE tribe now treated is called the Dog Family, and rightly so, for our domestic dogs are included in the group, which comprises the Wolves, Dogs, Jackals, Wild Dogs, and Foxes. Their general characters are too familiar to need description, but it should be noted that the foxes differ from the dogs in having contracting pupils to the eye (which in bright sun closes like a cat's to a mere slit), and some power of climbing. The origin of the domestic dog is still unsettled.

THE WOLF

This great enemy of man and his dependents—the creature against the ravages of which almost all the early races of Europe had to combine, either in tribes, villages, or principalities, to protect their children, themselves, and their cattle—was formerly found all over the northern hemisphere, both in the Old and New Worlds. In India it is rather smaller, but equally fierce and cunning, though, as there are no long winters, it does not gather in packs. In many lands the popular fear of the wolf has persisted for centuries, a momento of the time when this animal was man's most dreaded enemy. In Switzerland the ancient organisations of wolf clubs in the cantons are still maintained. In Brittany the Grand Louvetier is a government official. Every very hard winter wolves from the Carpathians and Russia move across the frozen rivers of Europe even to the forests of the Ardennes and of Fontainebleau. In Norway they ravage the reindeer herds of the Lapps. Only a few years ago an artist, his wife, and servant were all attacked on their way to Budapest, in Hungary, and the man and his wife killed. The last British wolf was killed in 1680 by Cameron of Lochiel. Wolves are common in Palestine, Persia, and India.

Without going back over the well-known history of the species, we will give some anecdotes of the less commonly known exploits of these fierce and dangerous brutes. Mr. Kipling's "Jungle Book" has given us an "heroic" picture of the life of the Indian wolves. There is a great deal of truth in it. Even the child-stealing by wolves is very probably a fact, for native opinion is unanimous in crediting it. Babies laid down by their mothers when working in the fields are constantly carried off and devoured by them, and stories of their being spared and suckled by the she-wolves are very numerous.

Indian wolves hunt in combination, without assembling in large packs. The following is a remarkable instance, recorded by General Douglas Hamilton: "When returning with a friend from a trip to the mountain caves of Ellora, we saw a herd of antelope near a range of low rocky hills; and as there was a dry nullah, or watercourse, we decided on having a stalk. While creeping up the nullah, we noticed two animals coming across the plain on our left. We took them at first for leopards, but then saw that they were wolves. When they were about 500 yards from

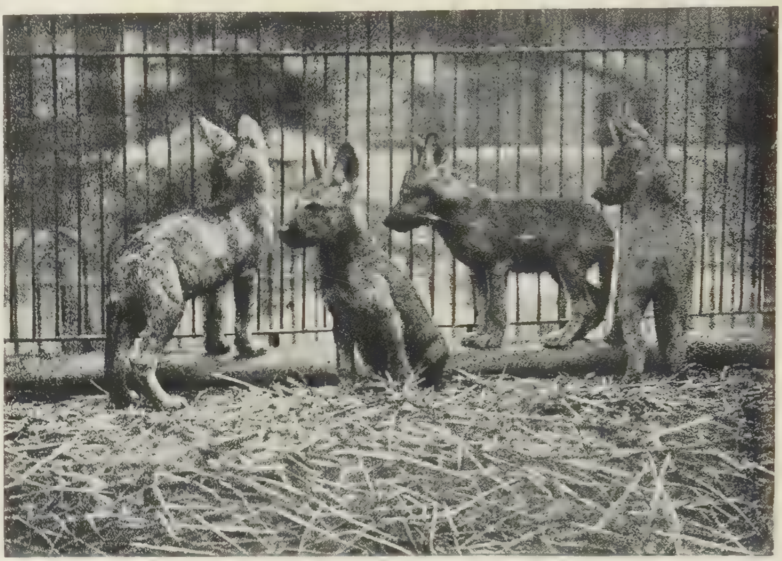


Photo by Scholastic Photo. Co.] [*Parson's Green*

WOLF CUBS

These are evidently the foster-brothers of Romulus and Remus

the antelope, they lay down quietly. After about ten minutes or so, the smaller of the two got up and trotted off to the rocky hills, and suddenly appeared on the ridge, running backwards and forwards like a Scotch collie dog. The larger wolf, as soon as he saw that the antelope were fully occupied in watching his companion, got up and came as hard as he could gallop to the nullah. Unfortunately he saw us and bolted; and his companion, seeing there was something wrong, did the same. Now, it is evident that these wolves had regularly planned this attack. One was to occupy the attention of the antelope, the other to steal up the watercourse and dash into the midst of them. At another time a brother-officer of mine was stalking a herd of antelope which were feeding down a grassy valley, when suddenly a wolf got up before him, and then another and then another, until fourteen wolves rose out of the grass. They were extended right across the valley in the shape of a fishing-net or jelly-bag, so that as soon as the herd had got well into the jelly-bag they would have rushed on the antelope, and some must have fallen victims to their attack." They have been known to join in the chase of antelopes by dogs. Captain Jackson, of the Nizam's service, let his dogs course an antelope fawn. A wolf jumped up, joined the dogs, and all three seized the fawn together. He then came up, whipped off the dogs and the wolf, and secured the fawn, which did not seem hurt. The wolf immediately sat down and began to howl at the loss of his prey, and in a few moments made a dash at the officer, but when within a few yards thought better of it, and recommenced howling. This brought another wolf to his assistance. Both howled and looked very savage, and seemed inclined to make another dash at the antelope. But the horse-keepers came up, and the wolves retired.

The Indian wolf, if a male, stands about 26 inches high at the shoulder. The length of head and body is 37 inches; tail, 17 inches.

The same species practically haunts the whole of the world north of the Himalaya. It varies in colour from almost black to nearly pure white. In the Hudson Bay fur-sales every variety of colour between these may be seen, but most are of a tawny brindle. The male grows to a very great size. One of the largest ever seen in Europe was for years at the London Zoo. It stood 6 feet high when on its hind legs, and its immense head and jaws seemed to occupy one-third of the space from nose to tail. Horses are the main prey of the NORTHERN WOLF. It will kill any living creature, but horse-flesh is irresistible. It either attacks by seizing the flank and throwing the animal, or bites the hocks. The biting power is immense. It will tear a solid mass of flesh at one grip from the buttock of a cow or horse. In the early days of the United States, when Audubon was making his first trip up the head-waters of the Missouri, flesh of all kinds was astonishingly abundant on the prairies. Buffalo swarmed, and the Indians had any quantity of buffalo meat for the killing. Wolves of very large size used to haunt the forts and villages, and were almost tame, being well fed and comfortable. Far different was the case even near St. Petersburg at the same period. A traveler in 1840 was chased by a pack of wolves so

Photo by L. Medland, F.Z.S.] [*North Finchley*

WHITE WOLF

closely that when the sledge-horses reached the post-house and rushed into the stable, the doors of which were open, seven of the wolves rushed in after them. The driver and traveler leaped from the sledge just as it reached the building, and horses and wolves rushed past them into it. The men then ran up and closed the doors. Having obtained guns, they opened the roof, expecting to see that the horses had been killed. Instead all seven wolves were slinking about beside the terrified horses. All were killed without resistance.

In Siberia and Russia the wolves in winter are literally starving. Gathering in packs, they haunt the roads, and chase the sledges with their unfaltering gallop. Seldom in these days does a human life fall victim; but in very hard winters sledge-horses are often killed, and now and then a peasant. Rabies is very common among wolves. They then enter the villages, biting and snapping at every one. Numbers of patients are sent yearly from Russia and Hungary to the Pasteur Institutes, after being bitten by rabid wolves. In Livonia, in 1823, it was stated that the following animals had been killed by wolves: 15,182 sheep, 1,807 oxen, 1,841 horses, 3,270 goats, 4,190 pigs, 703 dogs, and numbers of geese and fowls. They followed the Grand Army from Russia to Germany in 1812, and restocked the forests of Europe with particularly savage wolves. It is said that in the retreat

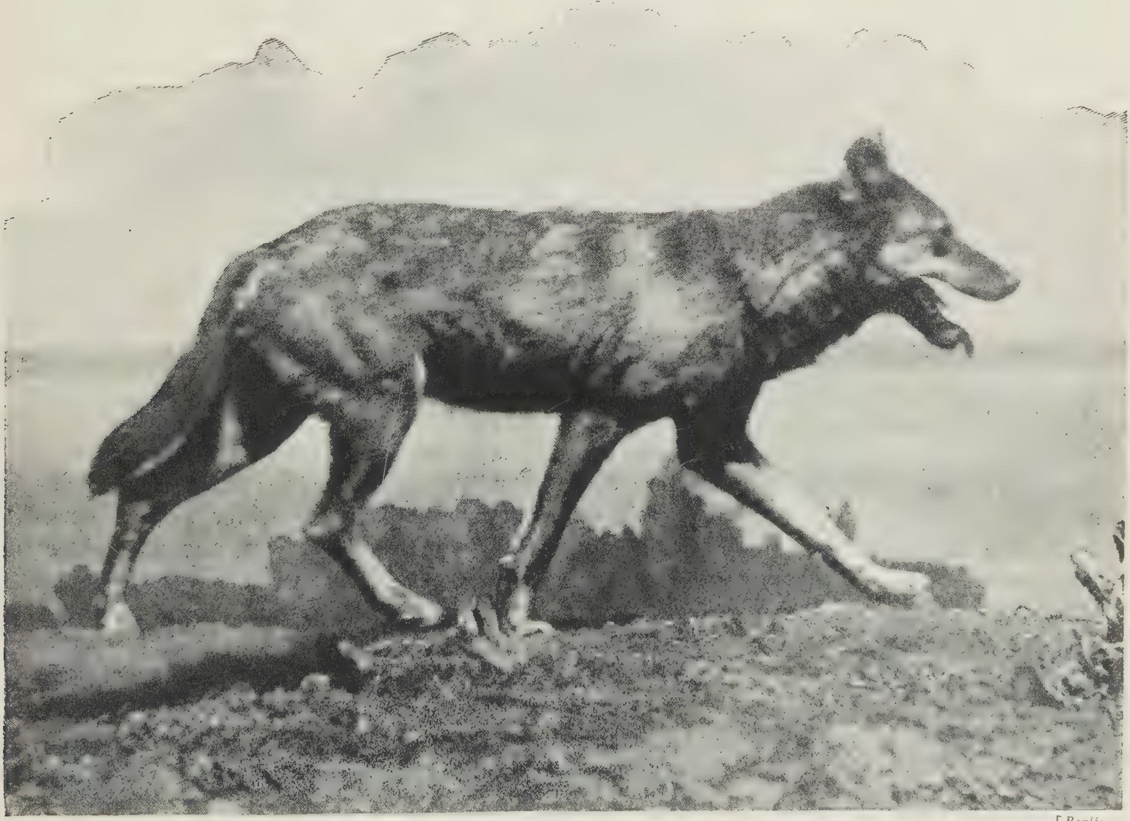


Photo by Ottomar Anschutz] [*Berlin*

"THE WOLF WITH PRIVY PAW"

The photograph shows admirably the slinking gate and long stride of the wolf from Moscow twenty-four French soldiers, with their arms in their hands, were attacked, killed, and eaten by a pack of wolves.

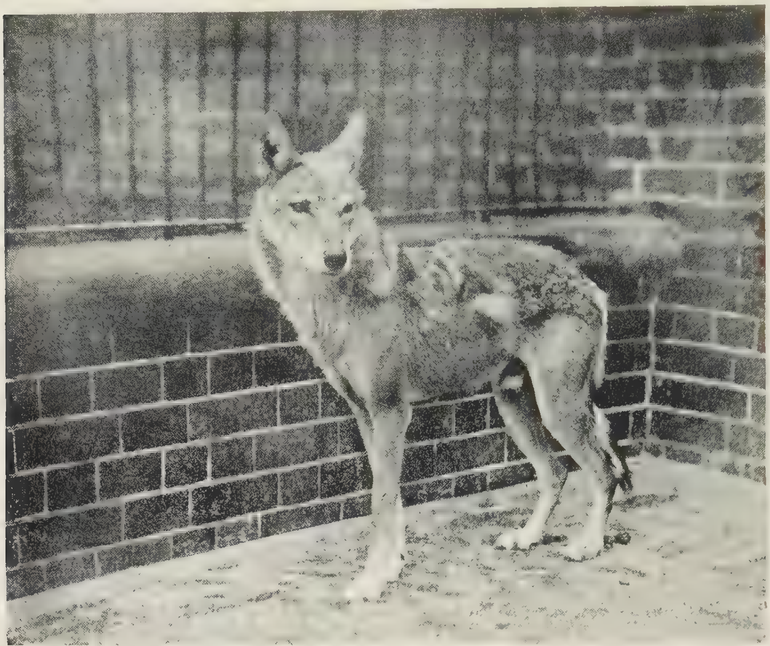


Photo by J. W. McLellan] [Highbury

RUSSIAN WOLF

This is a most characteristic photograph of one of the so-called "greyhound wolves" of the Russian forest

From very early times special breeds of dogs have been trained to guard sheep against the attacks of wolves. Some of these were intended to defend the flock on the spot, others to run down the wolves in the open. The former are naturally bred to be very large and heavy; the latter, though they must be strong, are light and speedy. Of the dogs which guard the flocks several races still survive. Among the most celebrated are those of Albania and the mountainous parts of Turkey, and the wolf-dogs of Tibet, generally called Tibetan Bloodhounds. The Tartar shepherds on the steppes near the Caucasus also keep a very large and ferocious breed of dog. All these are of the mastiff type, but have long, thick hair. When the shepherds of Albania or Mount Rhodope are driving their flocks along the mountains to the summer pastures, they sometimes travel a distance of 200 miles. During this march the dogs act as flankers and scouts by day and night, and do battle with the wolves, which know quite well the routes along which the sheep usually pass, and are on the lookout to pick up stragglers or raid the flock. The Spanish shepherds employ a large white shaggy breed of dog as guards against wolves. These dogs both lead the sheep and bring up the rear in the annual migration of the flocks to and from the summer pastures.

Colonel Theodore Roosevelt says of hunting wolves: "In Russia the sport is a science. The princes and great landowners who take part in it have their hunting-equipages equipped perfectly to the smallest detail. Not only do they follow wolves in the open, but they capture them and let them out before dogs, like hares in a closed coursing-meeting. The huntsman follows his hounds on horseback. (These hounds are the Borzoi, white giant greyhounds, now often seen in England.) Those in Russia show signs of reversion to the type of the Irish wolf-hound, dogs weighing something like 100 lbs., of remarkable power, and of reckless and savage temper. Now three or four dogs are run together. They are not expected to kill the wolf, but merely to hold him. . . . The Borzois can readily overtake and master partly grown wolves, but a full-grown dog-wolf, in good trim, will usually gallop away from them."

Wolf cubs are born in April or May. The litter is from four to nine. There was one of six a few years ago at the Zoological Gardens at The Hague, pretty little creatures like collie puppies, but quarrelsome and rough even in their play. When born, they were covered with reddish-white down; later the coat became woolly and dark.

The European wolf's method of hunting when in chase of deer is by steady pursuit. Its speed is such and its endurance so great that it can overtake any animal. But there is no doubt that the favourite food of the wolf is mutton, which it can always obtain without risk on the wild mountains of the Near East, if once the guardian dogs are avoided. M. Tschudi, the naturalist of the Alps, gives a curious account of the assemblage of wolves in Switzerland in 1799. They had, as it is mentioned above, followed the armies from Russia. Having tasted human flesh, they preferred it to all other, and even dug up the corpses. The Austrian, French, and Russian troops penetrated in 1799 into the highest mountain valleys of Switzerland, and fought sanguinary battles there. Hundreds of corpses were left on the mountains and in the forests, which acted as bait to the wolves, which were not destroyed for some years.

Wolves will interbreed with dogs readily, which the red fox will not. The progeny do not bark, but howl. The Eskimo cross their dogs with wolves to give them strength.

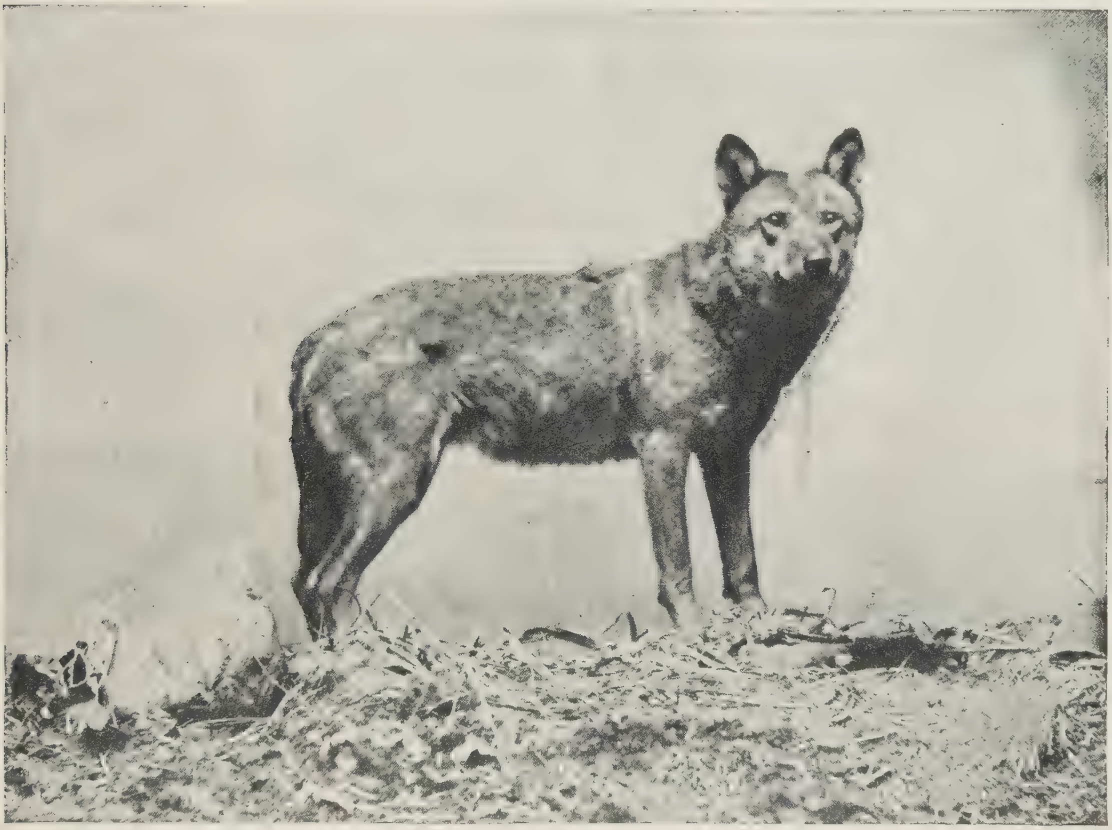


Photo by Ottomar Anschutz] [*Berlin*

WOLF OF THE CARPATHIANS

This wolf is a shorter and more heavily built specimen than the Russian wolf on the previous page

Photo by L. Medland, F.Z.S.] [*North Finchley*

INDIAN WOLF

This photograph shows the Indian wolf alarmed. It has a reputation for stealing children as well as killing cattle

Some years ago experiments were made at the Regent's Park Zoological Gardens to ascertain if there were any foundation for the old legends that wolves feared the sound of stringed instruments such as the violin. Every one will remember the story of the fiddler pursued by wolves. It is said that as the pack overtook him he broke a string of his instrument, and that the sudden noise of the parting cord caused the pack to stand still for a minute, and so enabled him to reach a tree, which he climbed. Further, that when he improved on the hint so given, and played his fiddle, the wolves all sat still; when he left off, they leapt up and tried to reach him. Experiments with the Zoo wolves showed that there was no doubt whatever that the low minor chords played on a violin cause the greatest fear and agitation in wolves, both European and Indian. The instrument was first played behind the den of an Indian wolf, and out of sight. At the first sound the wolf began to tremble, erected its fur, dropped its tail between its legs, and crept uneasily across its den. As the sound grew louder and more intense, the wolf trembled so violently, and showed such physical evidence of being dominated by excessive fright, that the keeper begged that the experiment might be discontinued, or the creature would have a fit. A large European wolf is described in "Life at the Zoo" as having exhibited its dislike of the music in a different way. It set up all its fur till it looked much larger than its ordinary size, and drew back its lips until all the white teeth protruding from the red gums were shown. It kept silent till the violin-player approached it; then it flew at him with a ferocious growl, and tried to seize him.

There are instances of wolves having been quite successfully tamed, and developing great affection for their owners. They are certainly more dog-like than any fox; yet even the fox has been tamed so far as to become a domesticated animal for the lifetime of one particular individual. An extraordinary instance of this was lately given in *Country Life*, with a photograph of the fox. It was taken when a cub, and brought up at a large country house with a number of dogs.

Photo by Ottomar Anschütz] [*Berlin*

WOLF'S HEAD

A very fine study of the head, jaws, and teeth of a female wolf. The head of the male is much larger

Photo by Scholastic Photo. Co.] RUSSIAN WOLF [Parson's Green

Note the expression of fear and ferocity on the face of this wolf; also the enormously powerful jaws

Among these were three terriers, with which it made friends. There were plenty of wild foxes near, some of which occasionally laid up in the laurels in a shrubbery not far from the house. These laurels were, in fact, a fairly safe find for a fox. It was the particular sport of the terriers to be taken to "draw" this bit of cover, and to chase out any fox in it. On these expeditions the tame fox invariably accompanied them, and took an active part in the chase, pursuing the wild fox as far as the terriers were able to maintain the hunt.

In Central Asia the wolves lie out singly on the steppes during the summer, and feed on the young antelopes and the lambs and kids of the Tartar's flocks. The Kirghiz organise wolf-killing parties, to which as many mounted men and dogs come as can be brought together. In order to aid the dogs, the Tartars often employ eagles trained to act like falcons, which sit on the arm of the owner. As the eagle is too heavy to be carried for any time in this way, a crutch is fastened to the left side of the saddle, on which the bearer of the falcon rests his arm. When a wolf is sighted, the eagle is loosed, and at once flies after the wolf, and overtakes it in a short time, striking at its head and eyes with its talons, and buffeting it with its wings. This attack so disconcerts the wolf that it gives time for the dogs to come up and seize it.

The habits of the Siberian wolf are rather different from those in West Russia, and the settlers and nomad Tartars of Siberia are far more adventurous and energetic in defending themselves against its ravages than the peasants of European Russia. Being mounted, they also have a great advantage in the pursuit. The result is that Siberian wolves seldom appear in large packs, and very rarely venture to attack man. Yet the damage they do to the flocks and herds which constitute almost the only property of the nomad tribes is very severe.

Both the Russians and Siberians believe that when a she-wolf is suckling her young she carefully avoids attacking flocks in the neighbourhood of the place where the cubs lie, but that if she be robbed of her whelps she revenges herself by attacking the nearest flock. On this account the Siberian peasants rarely destroy a litter, but hamstring the young wolves and then catch them when partly grown, and kill them for the sake of their fur. Among the ingenious methods used for shooting wolves in Siberia is that of killing them from sledges. A steady horse is harnessed to a sledge, and the driver takes his seat in front as usual. Behind sit two men armed with guns, and provided with a small pig, which is induced to squeak often and loudly. In the rear of the sledge a bag of hay is trailed on a long rope. Any wolf in the forest near which hears the pig concludes that it is a young wild one separated from its mother. Seeing the hay-bag trailing behind the sledge in the dusk, it leaps out to seize it, and is shot by the passengers sitting on the back seat of the sledge.

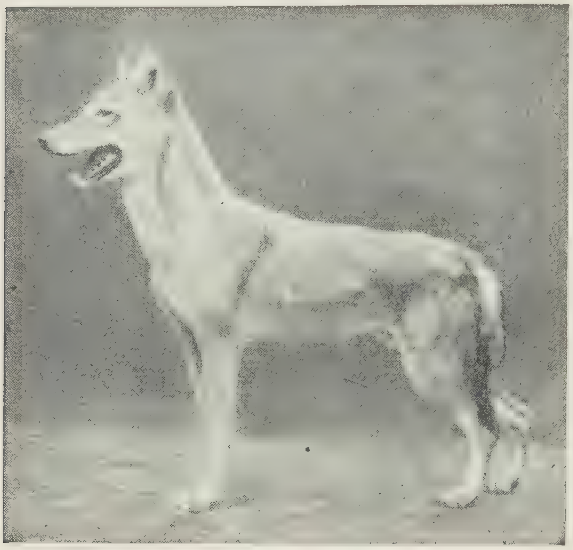


Photo by L. Medland, F.Z.S.] [North Finchley

NORTH AFRICAN JACKAL

This is the common jackal of Cairo and Lower Egypt

THE JACKAL

Of the Wild Canine Family, the JACKAL is the next in numbers and importance to the wolves. Probably in the East it is the most numerous of any. In India, Egypt, and Syria it regularly haunts the outskirts of cities, and lives on refuse. In the Indian plains wounded animals are also killed by the jackals. At night the creatures assemble in packs, and scour the outskirts of the cities. Horrible are the howlings and weird the cries of these hungry packs. In Ceylon they live in the hills and open country like foxes, and kill the hares. When taken young jackals can be tamed, and have all the manners of a dog. They wag their tails, fawn on their master, roll over and stick up their paws, and could probably be domesticated in a few generations, were it worth while. They eat fruits and vegetables, such as melons and pumpkins, eagerly.

In Africa two species are found—the BLACK-BACKED JACKAL and the STRIPED JACKAL; the former is the size of a large English fox. The young jackals are born in holes or earths; six seems to be the usual number of puppies. They have nearly always a back door by which they can escape; this is just large enough for the puppies to squeeze through, whatever their size. When fox-terriers are put into the earth, the jackal puppies fly out of their back doors, through which, as a rule, the terriers are unable to follow them. Should there be no one outside, the puppies race out on to the veldt as hard as they can go. This jackal is terribly destructive to sheep and lambs in the Colony. A reward of $1.80 per tail is paid to the Kaffirs for killing them. The SIDE-STRIPED JACKAL is a Central African species, said to hunt in packs, to interbreed with domestic dogs, and to be most easily tamed.

Both in India and South Africa the jackal has been found to be of some service to the white man by providing him with a substitute for the fox to hunt. It has quite as remarkable powers of endurance as the fox, though it does not fight in the same determined way when the hounds overtake it. But it is not easy to estimate the courage of a fox when in difficulties. The writer has known one, when coursed by two large greyhounds, to disable both almost instantaneously. One was bitten across the muzzle, the other through the foot. The fox escaped without a bite from either. In India the hounds used are drafts from English packs. The hot weather does not suit them, and they are seldom long-lived; but while they are in health they will run a jackal across the

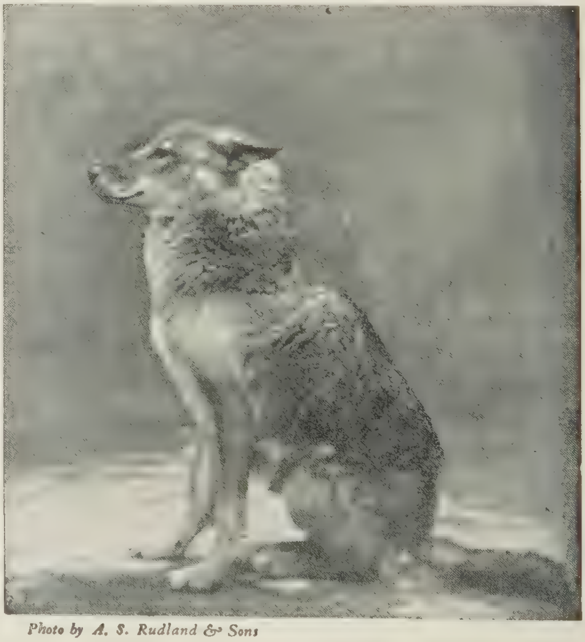


Photo by A. S. Rudland & Sons

INDIAN JACKAL

This Indian jackal might be sitting for his portrait in Mr. Rudyard Kipling's tale of the "undertakers"—the jackal, alligator, and adjutant

Indian plains as gaily as they would a fox over the Hampshire Downs. The meet is very early in the morning, as the scent then lies, and riding is not too great an exertion. The ground drawn is not the familiar English covert, but fields, watercourses, and old buildings. A strong dog-jackal goes away at a great pace, and as the ground is open the animal is often in view for the greater part of the run; but it keeps well ahead of the hounds often for three or four miles, and if it does not escape into a hole or ruin is usually pulled down by them. Major-General R. S. S. Baden-Powell has written and illustrated an amusing account of his days with the fox-hounds of South Africa hunting jackals. The local Boer farmers, rough, unkempt, and in ragged trousers, used to turn up smoking their pipes to enjoy the sport with the smartly got-up English officers. When once the game was found, they were just as excited as the Englishmen, and on their Boer ponies rode just as hard, and with perhaps more judgment.

Photo by A. S. Rudland & Sons

MANED WOLF

A South American animal; its coat is a chestnut-red

Photo by L. Medland, F.Z.S.] *[North Finchley*

TURKISH JACKAL

This Jackal is common in both Turkey in Europe and in Asia. Near Constantinople it feeds largely on the bodies buried in the cemeteries at Scutari

Jackals are said to be much increasing in South Africa since the outbreak of the war. The fighting has so far arrested farming operations that the war usually maintained on all beasts which destroy cattle or sheep has been allowed to drop. In parts of the more hilly districts both the jackal and the leopard are reappearing where they have not been common for years, and it will take some time before these enemies of the farmer are destroyed.

THE MANED WOLF

This is by far the largest of several peculiar South American species of the Dog Family which we have not room to mention. It occurs in Paraguay and adjoining regions, and is easily distinguishable by its long limbs and large ears. It is chestnut-red in colour, with the lower part of the legs black, and is solitary in its habits.

Photo by A. S. Rudland & Sons

WILD DOG

These animals range from the plains of India and Burma to the Tibetan Plateau and Siberia. They hunt in small packs, usually by day, and are very destructive to game, but seldom attack domestic animals

The Wild Dog of Africa, or Cape Hunting-dog

This is a most interesting creature, differing from the true dogs in having only four toes on both fore and hind feet, and in being spotted like a hyæna. These dogs are the scourge of African game, hunting in packs. Long of limb and swift of foot, incessantly restless, with an overpowering desire to snap and bite from mere animal spirits, the Cape wild dog, even when in captivity and attached to its master, is an intractable beast. In its native state it kills the farmers' cattle and sheep and the largest antelopes. A pack has been seen to kill and devour to the last morsel a large buck in fifteen minutes. Drummond says: "It is a marvelous sight to see a pack of them hunting, drawing cover after cover, their sharp bell-like note ringing through the air, while a few of the fastest of their number take up their places along the expected line of the run, the wind, the nature of the ground, and the habits of the game being all taken into consideration with wonderful skill." The same writer says that he has seen them dash into a herd of cattle feeding not a hundred yards from the house, drive out a beast, disappear over a rising ground, kill it, and pick its bones before a horse could be saddled and ridden to the place.

Photo by Scholastic Photo. Co.] [Parson's Green

DINGO

The wild dog of Australia. It was found there by the first discoverers, but was probably introduced from elsewhere

The Indian Wild Dogs

Mr. Rudyard Kipling's stories of the "Dhole," the red dogs of the Indian jungle, have made the world familiar with these ferocious and wonderfully bold wild dogs. There is very little doubt that they were found in historic times in Asia Minor. Possibly the surviving stories of the "Gabriel hounds" and other ghostly packs driving deer alone in the German and Russian forests, tales which remain even in remote parts of England, are a survival of the days when the wild dogs lived in Europe. At present there is one species of long-haired wild dog in West Central Siberia. These dogs

Photo by Kerry & Co.] [Sydney

DINGOES

The destruction done to the flocks of the settlers by the dingoes caused the latter to combine and almost to destroy these wild dogs

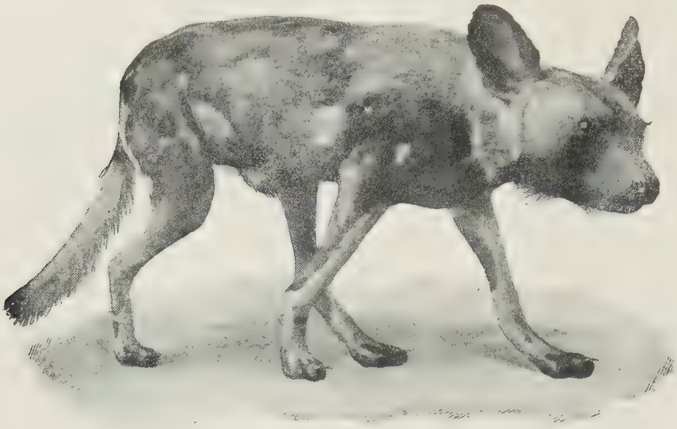


Photo by A. S. Rudland & Sons

CAPE HUNTING-DOG

This animal hunts in packs. It is very active and most destructive to large game of many kinds

killed nearly all the deer in the large forests near Omsk some years ago. Across the Himalaya there are several species, one of them as far east as Burma; but the most famous are the RED DOGS OF THE DECCAN. They frequent both the jungles and the hills; but their favourite haunt is the uplands of the Indian Ghats. They are larger than a jackal, much stronger, and hunt in packs. They have only ten teeth on each side, instead of eleven, as in the other dogs and foxes. There is no doubt that these fierce hunting-dogs actually take prey from the tiger's jaws, and probably attack the tiger itself. They will beset a tiger at any time, and the latter seems to have learnt from them an instinctive fear of dogs. Not so the leopard, which, being able to climb, has nothing to fear even from the "dhole." A coffee-planter, inspecting his grounds, heard a curious noise in the forest bordering his estate. On going round the corner of a thick bush, he almost trod on the tail of a tiger standing with his back towards him. He silently retreated, but as he did so he saw that there was a pack of wild dogs a few paces in front of the tiger, yelping at him, and making the peculiar noise which had previously attracted his attention. Having procured a rifle, he returned with some of his men to the spot. The tiger was gone, but they disturbed a large pack of wild dogs feeding on the body of a stag. This, on examination, proved to have been killed by the tiger, for there were the marks of the teeth in its neck. The dogs had clearly driven the tiger from his prey and appropriated it. The dread of the tiger for these wild dogs was discovered by the sportsmen of the Nilgiri Hills, and put to a good use. They used to collect scratch packs and hunt up tigers in the woods. The tiger, thinking they were the dreaded wild pack, would either leave altogether or scramble into a tree. As tigers never do this ordinarily, it shows how wild dogs get on their nerves.

Several South American wild dogs and foxes are included in the series with the wolves and jackals. Among these are AZARA'S DOG and the RACCOON-DOG. These are commonly called foxes, though they have wolf-like skulls.

THE DINGO

The only non-marsupial animal of Australia when the continent was discovered was the WILD DOG, or DINGO. Its origin is not known; but as soon as the settlers' flocks and herds began to increase its ravages were most serious, though doubtless some of the havoc with which it was accredited was due in a great measure to runaways from domestication. Anyhow, in the dingo the settlers found the most formidable enemy with which they had to contend, and vigorous measures were taken to reduce their numbers and minimise their ravages, so that by now they are nearly exterminated in Van Diemen's Land and rare on the mainland of Australia.

It is a fine, bold dog, of considerable size, generally long-coated, of a light tan colour, and with pricked-up ears. It is easily tamed, and some of those kept in this country have made affectionate pets. Puppies are regularly bred and sold at the Zoological Gardens. The animal has an elongated, flat head which is carried high; the fur is soft, and the tail bushy. In the wild state it is very muscular and fierce.

THE FOXES

Foxes form a very well-marked group. They have very pointed muzzles, strong though slightly built bodies, very fine thick fur, often beautifully coloured and very valuable, bushy tails, pricked-up ears, and eyes with pupils which contract by day into a mere slit. They are quite distinct from dogs (although wolves are not), and will not interbreed, though stories are told to the contrary. The smell of a fox is disgusting to a dog, and quite sufficient to distinguish it.

If the present writer takes a simpler view of the kinds and species of foxes than that adopted by many naturalists, he must plead to a study of the subject on slightly different lines than those usually followed. The skins of all foxes are valuable, some more than others. But they are sent in hundreds of thousands, and from all parts of the northern hemisphere, to London to the great fur-sales. There these differences can be studied as they can be studied nowhere else. As the habits and structure of foxes are much alike, allowing for differences of climate, and the discrepancies in size, not more than can be accounted for by abundance or scarcity of food, it seems pretty certain that these animals are some of the few, almost alone among mammals, showing almost every variety of colouring, from black to white, from splendid chameleon-red to salmon-pink, and many exquisite shades of brown, gray and silver. In the East, from Asia Minor to China, red, gray, and yellow fox skins are the lining of every rich man's winter wraps. Splendid mixed robes are made by the Chinese by inserting portions of cross fox-skins into coats of cut sable, giving the idea that it is the fur of a new animal.

Photo by C. Reid] [*Wishaw, N. B.*

FOX CUBS

Fox cubs are born from March 25 till three weeks later, the time when young rabbits, their best food, are most numerous

The Common Fox, the foundation or type of all the above, is the best known carnivorous animal in this country. Abroad its habits do not greatly differ, except that, not being hunted much with hounds, it is less completely nocturnal. It drops its young in a dugout early in April. Thither the mother carries food till late in June, when the cubs come out, and often move to a wood or a corn-field. There they are still fed, but learn to do a little on their own account by catching mice and moles. By late September the hounds come cub-hunting,

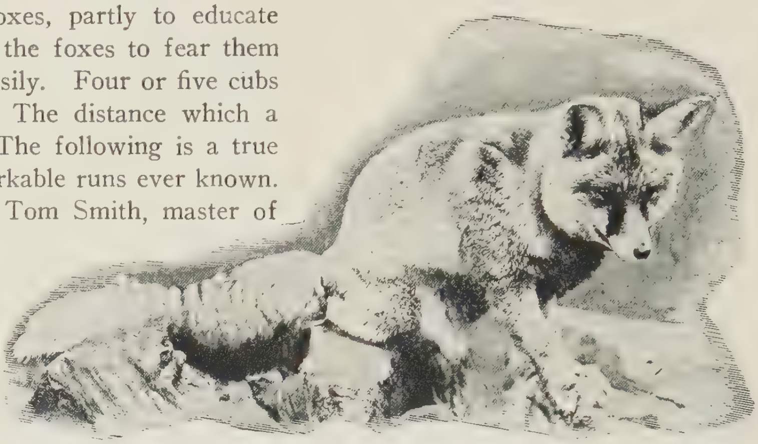


Photo by G. W. Wilson & Co., Ltd.]

MOUNTAIN-FOX

In hilly countries the fox becomes a powerful and destructive animal, killing not only game but lambs

partly to kill off superfluous foxes, partly to educate the young hounds, and to teach the foxes to fear them and to make them leave cover easily. Four or five cubs in a litter are commonly seen. The distance which a fox will run is extraordinary. The following is a true account of one of the most remarkable runs ever known. The hounds were those of Mr. Tom Smith, master of the Hambledon Hunt. He was the man of whom another famous sportsman said that if he were a fox he should prefer to be hunted by a pack of hounds rather than by Tom Smith with a stick in his hand. The fox was found in a cover called Markwells, at one o'clock in the afternoon in December, near Petersfield. It crossed into Sussex, and ran into an earth in Grafham Hill a little before dark. The fox had gone twenty-seven miles. The hounds had forty miles to go back to kennel that night, and three only found their way home four days afterwards. Dog-foxes assemble in considerable numbers when a vixen is about in spring, and at all times common foxes are sociable creatures, though not actually living in societies. Sometimes as many as five or six are found in a single earth. Two years ago five foxes and a badger were found in one near Romford. They eat mice, beetles, rats, birds, game, poultry, and frogs. Their favourite food is rabbits. If there are plenty of these, they will not touch other game. They hunt along the railway-lines for dead birds killed by the telegraph-wires. In the New Forest they also go down to the shore and pick up dead fish. One in the writer's possession was shot when carrying away a lamb from a sheepfold near the cliffs of Sidmouth, in Devon. The shepherd thought it was a marauding dog, and lay in wait with a gun.

THE FENNECS

Africa has a group of small foxes of its own. They have very large ears and dark eyes. Some of them remind us of the Maholis and other large-eyed lemuroids. Several are not more than 9 or 10 inches long; they are a whitish-khaki colour, but the eyes are very dark and brilliant.

Photo by C. Reid] [Wishaw, N. B.

LEICESTERSHIRE FOX

The COMMON FENNEC is found over the whole of Africa. Its favourite food is dates and any sweet fruit, but it is also fond of eggs, and will eat mice and insects. It is probably the original hero of the story of the fox and the grapes. The large-eared fennec, which is sometimes called the SILVER FOX, is found from the Cape to as far north as Abyssinia. It is 23 inches long, and lives mainly on insects and fruit.

DOMESTIC DOGS

BY C. H. LANE

THE DOG, almost without exception, shows a marked liking for the society of human beings, and adapts itself to their ways more than any other animal.

Fox-, Stag-, and Hare-hounds—the latter better known as Hariers and Beagles—have many points in common, much beauty of shape and colour, and great suitability for their work, though differing in some other particulars.

Another group—Greyhounds, Whippets, Irish Wolf-hounds, Scottish Deer hounds, all of which come under the category of Gaze-hounds, or those which hunt by sight—are built for great speed, to enable them to cope with the fleet game they pursue. In the same group should be included the BORZOI, or Russian Wolf-hound, now very popular in this country, with something of the appearance of the Scottish deer-hound about it as to shape, but with a finer, longer head, deeper body, more muscular limbs, and shaggier in the hair on body and tail.

The OTTER-HOUND is one of the most picturesque of all the hound tribe. This variety somewhat reminds one of a large and leggy Dandie Dinmont terrier, with a touch of the blood-hound, and is thought to have been originally produced from a cross between these or similar varieties.

The BLOOD-HOUND is another, with much style and beauty of shape, colour, and character about it which cannot fail to favourably impress any beholder. The matches or trials which have of late years been held in different localities have been most interesting in proving its ability for tracking footsteps for long distances, merely following them by scent, some time after the person hunted started on the trail. By the kindness of my friend Mr. E. Brough, I am able to give as an illustration a portrait of what he considers the best blood-hound ever bred.

Much valued by sportsmen with the gun are POINTERS, so called from their habit of remaining in a fixed position when their quarry is discovered, eagerly pointing in its direction until the arrival of the guns. They are most often white, with liver, lemon, or black markings; but occasionally self-colours, such as liver or black, are met with. They have been largely bred in the

Photo by F. H. Dembrey] [*Bristol*

STAG-HOUND PUPPIES

This gives an interesting group of hounds in kennel

Photo by T. Fall] [Baker Street

GREYHOUND

A typical specimen of this elegant variety

west of England. I have been fortunate in obtaining one of Mr. E. C. Norrish's celebrated strain as a typical specimen for illustration.

The Setter group, which comprises three varieties, are all useful and beautiful in their way. The English are usually white, with markings or tickings of blue, lemon, or black; they are rather long and narrow in the head, with bodies and sterns well feathered, and are graceful and active movers. Gordon setters, which are always black and tan in colour, and preferred without any white, are generally larger and stronger in build than the last-named. Irish setters are more on the lines of the English, being a rich tawny red in colour, rather higher on the leg, with narrow skulls, glossy coats, feathered legs and stern, ears set low and lying back, and lustrous, expressive eyes.

Retrievers may be divided into flat-coated and curly-coated. Both are usually black, but other colours are occasionally seen. The coats of the first-named are full, but without curl in them; while the latter have their bodies, heads, legs, thighs, and even tails covered with small close curls. The eyes of both should be dark, and the ears carried closely to the sides of the head. In an article dealing with retrievers, which appeared in the *Cornhill Magazine* under the title of "Dogs which Earn their Living," the author writes: "There is not the slightest doubt that in the modern retrievers acquired habits, certainly one acquired habit, that of fetching dead and wounded game, are transmitted directly. The puppies sometimes retrieve without being taught, though with this they also combine a greatly improved capacity for further teaching. Recently a retriever was sent after a winged partridge which had run into a ditch. The dog followed it some way down the ditch, and presently came out with an old rusty tea-kettle, held in its mouth by the handle. The kettle was taken from the dog, amid much laughter; then it was found that inside the kettle was the partridge! The explanation was that the bird, when wounded, ran into the ditch, which was narrow. In the ditch was the old kettle, with no lid on. Into this the bird crept; and as the dog could not get the bird out, it very properly brought out the kettle with the bird in it. Among dogs which earn their living, these good retrievers deserve a place in the front rank." The illustration shows a good flat-coated retriever at work.

The Spaniel group is rather large, including the English and Irish water-spaniels, the former an old-fashioned, useful sort, often liver or roan, with some white or other markings, and a good deal of curl in the coat and on the ears. His Irish brother is always some shade of liver in colour, larger in the body and higher on the leg, covered with a curly coat, except on the tail, which is nearly bare of hair, with a profusion of hair on the top of the head, often hanging down over the eyes, giving a comical appearance, and increasing his Hibernian expression. They

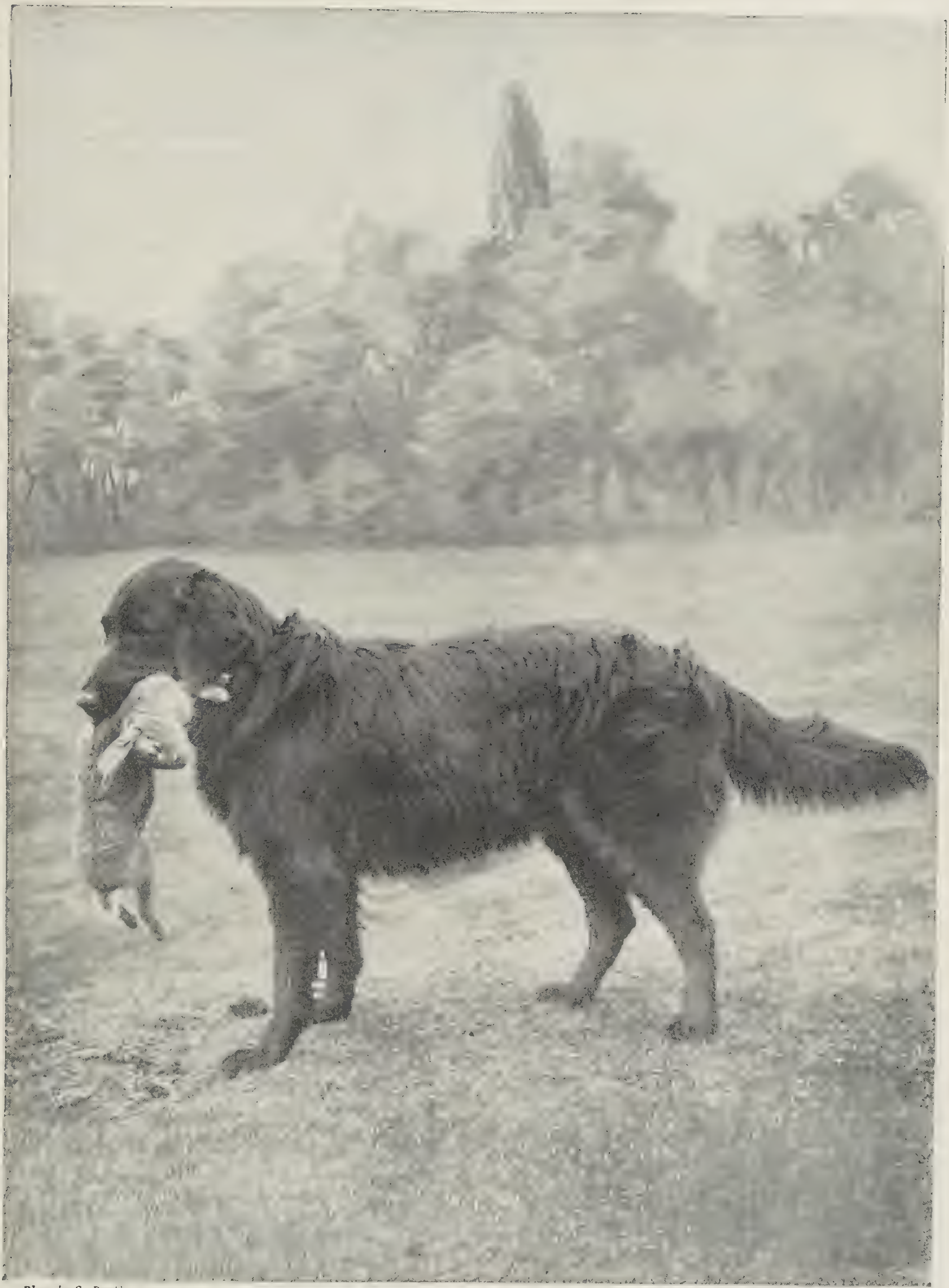
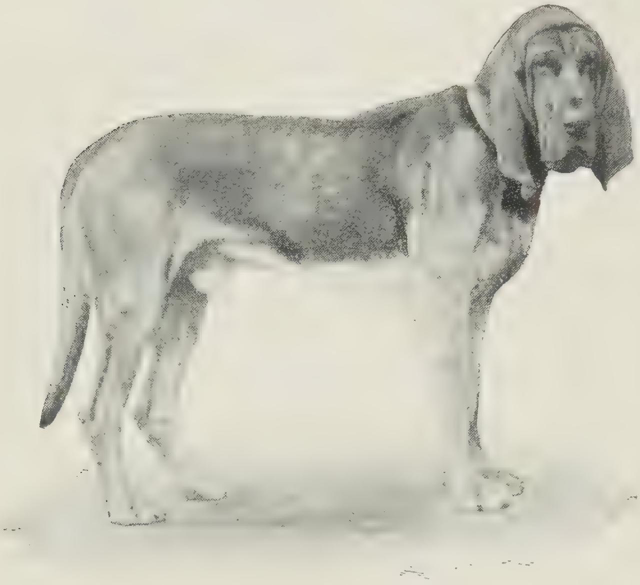


Photo by C. Reid [Wishaw, N. B.

RETRIEVER

This represents a flat-coated retriever at work, and is remarkably true to life



BLOOD-HOUND

This photograph shows what an almost perfect blood-hound should be like

make lively, affectionate companions and grand assistants at waterfowl-shooting.

Clumber Spaniels are always a creamy white, with lemon or light tan markings, and are rather slow and deliberate in their movements, but have a stylish, high-class look about them.

Sussex Spaniels are also rather heavy in build and of muscular frame, but can do a day's work with most others. They are a rich copper-red in colour, with low short bodies, long feathered ears, full eyes of deep colour, and are very handsome.

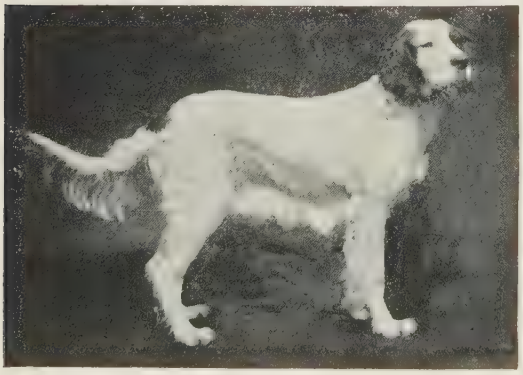
Black Spaniels should be glossy raven-black in colour, with strong muscular bodies on strong short legs, long pendulous ears, and expressive eyes. Good specimens are in high favour, and command long prices. I regret I cannot find room for an illustration of this breed, so deservedly popular.

Cockers, which are shorter in the back, higher on the leg, and lighter in weight, being usually under 25 lbs., are very popular, full of life, and very attractive in appearance.

Basset-hounds, both rough-and smooth-coated, are probably the most muscular dogs in existence of their height, with much dignity about them. In the Sporting Teams at the Royal Agricultural Hall there were some thirteen or fifteen teams of all kinds of sporting dogs, and of these a team each of rough and smooth bassets was in the first four.

Dachshunds are often erroneously treated as Sporting Dogs. There are certainly not so many supporters of the breed as formerly. Their lean heads, with long hanging ears, long low bodies, and crooked fore legs, give them a quaint appearance. The colours are usually shades of chestnut-red or black and tan; but some are seen chocolate and "dappled," which is one shade of reddish brown, with spots and blotches of a darker shade all over it.

Great Danes, though mostly classed amongst Non-sporting Dogs, have much of the hound in their bearing and appearance. The whole-coloured are not so popular as the various shades of brindle and harlequin, but I have seen many beautiful fawns, blues, and other whole colours.



ENGLISH SETTER

A typical but rather coarse specimen of a beautiful variety

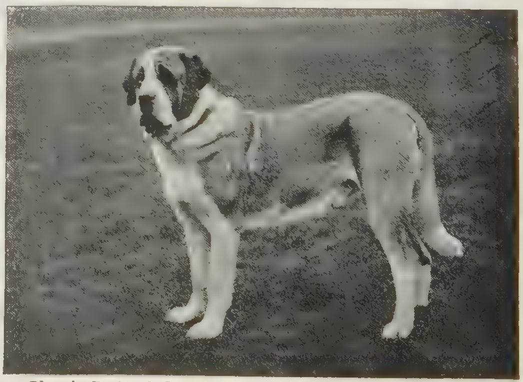


Photo by E. Landor] [*Ealing*

SMOOTH-COATED SAINT BERNARD

The illustration gives a capital idea of these handsome dogs

They are being bred with small natural drooping ears. One of the first I remember seeing exhibited was a large harlequin belonging to the late Mr. Frank Adcock, with the appropriate name of "Satan," as, although always shown muzzled, he required the attentions of three or four keepers to deal with him; and at one show I attended he overpowered his keepers, got one of them on the ground, tore his jacket off, and gave him a rough handling.

Photo by Fratelli Alinari] [Florence

GREAT DANE

This shows a typical specimen of this breed, with cropped ears, which will be discontinued in show dogs

NON-SPORTING VARIETIES.

SAINT BERNARDS, although sometimes exceeding 3 feet at the shoulder, are as a rule very docile and good-tempered, and many are owned by ladies. The coat may be rough or smooth, according to taste; but either are splendid animals. They are sometimes seen self-coloured, but those with markings—shades of rich red, with white and black, for preference—are the handsomest. They are still used as "first aids" in the snow on the Swiss mountains. So far as I remember, this is the only breed of dog used for stud and exhibition for which as much as $7,500 has been paid; and this has occurred on more than one occasion.

NEWFOUNDLANDS have regained their place in popularity, and many good blacks and black-and-whites can now be seen. Numerous cases are on record of their rendering aid to persons in danger of drowning, and establishing communication with wrecked vessels and the shore.

MASTIFFS are looked on as one of the national breeds. Their commanding presence and stately manner make them highly suitable as guards, and they are credited with much attachment and devotion to their owners. The colours are mostly shades of fawn with black muzzle, or shades of brindle. I am able to give the portrait of one of the best specimens living, belonging to Mr. R. Leadbeater.

BULL-DOGS are also regarded as a national breed. They are at present in high favour. The sizes and colours are so various that all tastes can be satisfied. Recently there has been a fancy for toy bull-dogs, limited to 22 lbs. in weight, mostly with upright ears of tulip shape. In spite of the many aspersions on their character, bull-dogs are usually easy-going and good-tempered, and are often very fastidious feeders—what fanciers call "bad doers."

[Baker Street

DACHSUND

The photograph conveys a fair idea of these quaint dogs

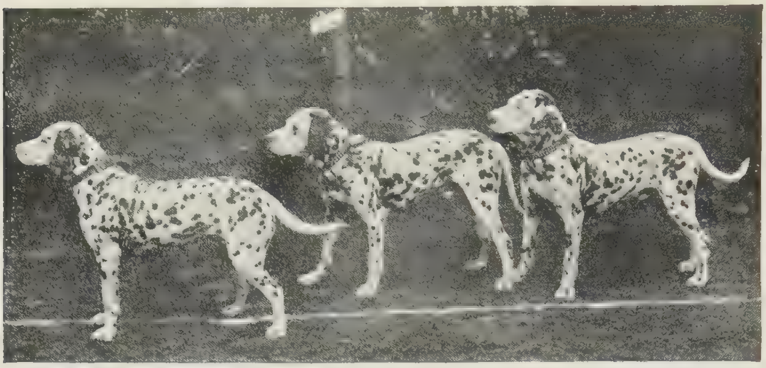


Photo by Kitchener Portrait Co.

DALMATIANS

All are typical, but the first is the best in quality and marking

Rough Collies are very graceful, interesting creatures, and stand first in intelligence among canines. They are highly popular. Several have been sold for over $5,000, and the amounts in prize-money and fees obtained by some of the "cracks" would surprise persons not in "the fancy." A high-bred specimen "in coat" is most beautiful. The colours most favoured are sables with white markings; but black, white, and tans, known as "tricolors," are pleasing and effective. I quite hoped to give a portrait of one of the most perfect of present-day champions, belonging to H. H. the Princess de Montglyon, but could not find room.

Smooth Collies are a handsome breed, full of grace, beauty, and intelligence, and very active and lively. A favourite colour is merle, a sort of lavender, with black markings and tan and white in parts, usually associated with one or both eyes china-coloured. Specimens often win in sheep-dog trials; a bitch of mine won many such, and was more intelligent in other ways than many human beings.

Old English Sheep-dogs are a most fascinating breed, remarkably active, possessed of much endurance and resource, and very faithful and affectionate. I have often made long

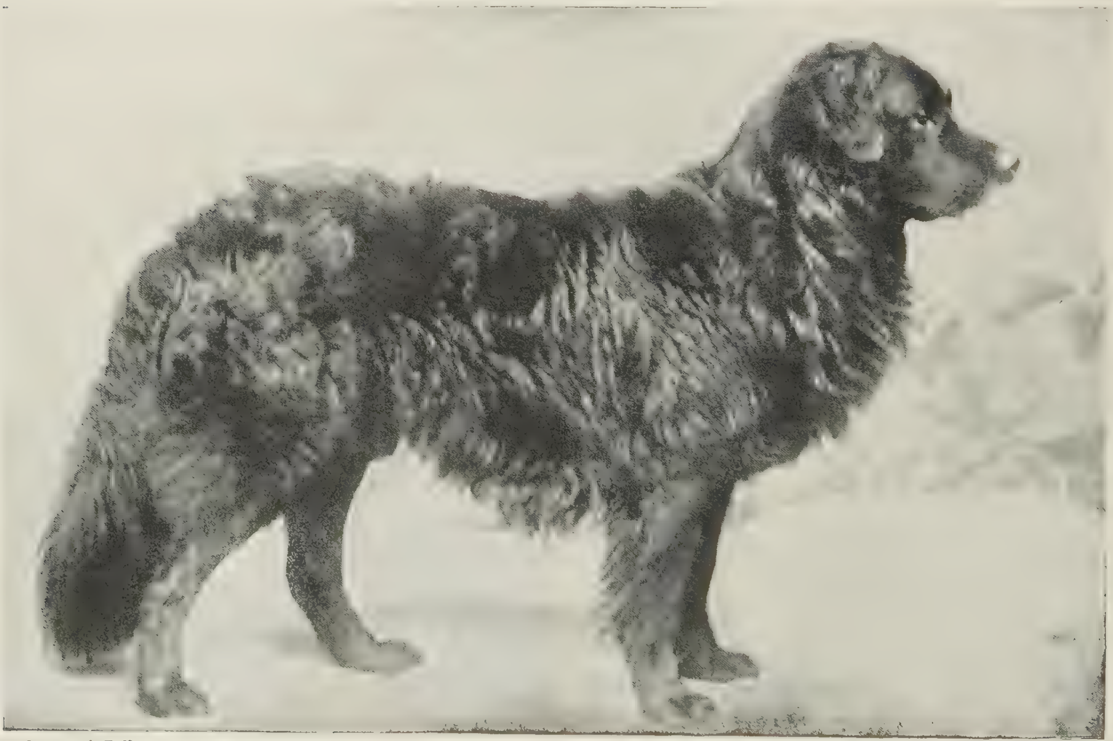


Photo by T. Fall] [Baker Street

NEWFOUNDLAND

The dog shown here gives a good idea of size and character, but is not in best coat journeys through cross-country roads accompanied by one or more of them, and never knew them miss me, even on the darkest night or in the crowded streets of a large town. The favourite colour is pigeon-blue, with white collar and markings. The coat should be straight and hard in texture. The illustration is from a portrait of one of the best bitches ever shown, belonging to Sir H. de Trafford.

Dalmatians are always white, with black, liver, or lemon spots, the size of a shilling or less, evenly distributed over the body, head, ears, and even tail, and pure, without mixture of white. There is much of the pointer about this variety, which has long been used for sporting purposes on the continent of Europe. I can testify to their many good qualities as companions and house-dogs. To quote again from the article above mentioned: "It is commonly believed that the spotted carriage-dogs once so frequently kept in stables were about the most useless creatures of the dog kind, maintained only for show and fashion. This is a mistake. They were used at a time when a traveling-carriage carried, besides its owners, a large amount of valuable property, and the dog watched the carriage at night when the owners were sleeping at country inns. We feel we owe an apology to the race of carriage-dogs. . . . While this dog is becoming extinct, in spite of his useful qualities, other breeds are invading spheres of work in which they had formerly no part." There is only one point in which I differ from the above, and that is contained in the last sentence. There are a number of enthusiastic breeders very keen on reviving interest in this variety, and I have during the last few years had large entries to judge, so that we shall probably see more of them in the future.

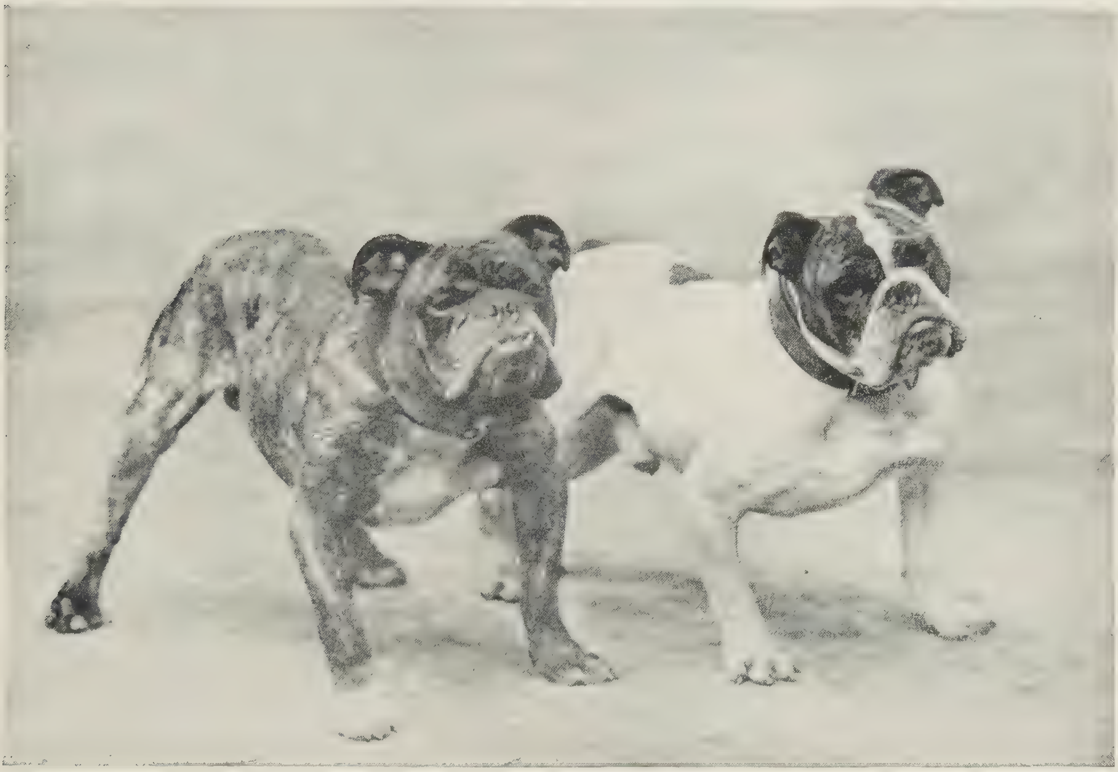
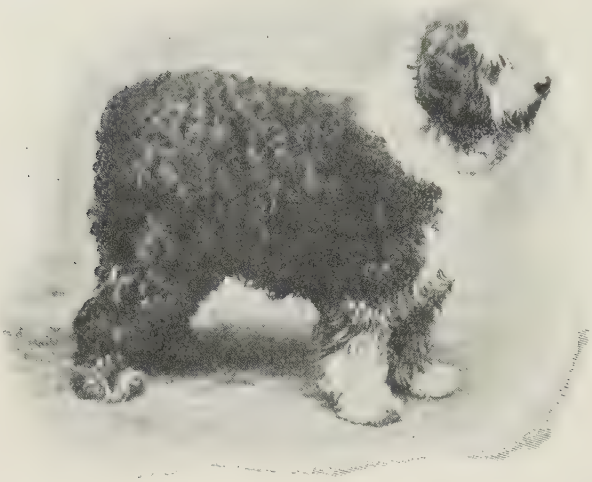


Photo by T. Fall] [*Baker Street*

BULL-DOGS

The photograph is remarkably good and characteristic of this variety

Poodles are of many sizes and colours. They are very intelligent, easily taught tricks, and much used as performing dogs. They have various kinds of coats: *corded*, in which the hair hangs in long strands of ringlets; *curly*, with a profusion of short curls all over them, something



OLD ENGLISH SHEEP-DOG

This is a remarkably fine photograph of a well-known specimen of this interesting variety

like retrievers; and *fluffy*, when the hair is combed out, to give much the appearance of fleecy wool. A part of the body, legs, head, and tail is usually shorn.

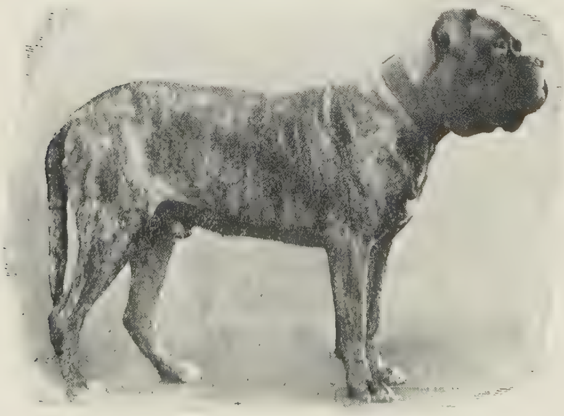
Bull-terriers are now bred with small natural drooping ears, and should have long wedge-shaped heads, fine coats, and long tails. There is also a toy variety, which hitherto has suffered from round skulls and tulip ears, but is rapidly improving. I have bred many as small as 3 lbs. in weight. In each variety the colour preferred is pure white, without any markings, and with fine tapering tails.

Irish Terriers are very popular, and should be nearly wholly red in colour, with long lean heads, small drooping ears, hard coats, not too much leg, and without coarseness. They make good comrades.

Bedlington Terriers have long been popular in the extreme north of England, and are another fighting breed. It is indeed often difficult to avoid a difference of opinion between show competitors. Their lean long heads, rather domed skulls, with top-knot of lighter hair, long pointed ears, and small dark eyes, give them a peculiar appearance. The coats, which are "linty" in texture, should be shades of blue or liver.

Three breeds, all more or less hard in coat-texture, and grizzled in colour on heads and bodies, while tanned on other parts, are Airedale, Old English, and Welsh Terriers, which may be divided into large, medium, and small. The first-named make very good all round dogs; the Old English, less in number, make useful dogs, and are hardy and companionable; while Welsh terriers are much the size of a small wire-haired fox-terrier, but usually shorter and somewhat thicker in the head. I intended one of Mr. W. S. Glynn's best dogs to illustrate the last-named.

Fox-terriers are both smooth- and wire-haired. Their convenient size and lively temperament make them very popular as pets and companions for both sexes and all ages. The colour is invariably white, with or without markings on head or body, or both.



MASTIFF

The photograph gives almost an ideal picture of this splendid breed, the colour being known as black-brindle

Black-and-tan and White English Terriers are built upon the same lines, differing chiefly in colour, the former being raven-black, with tan markings on face, legs and some lower parts of the body, and the latter pure white all over. Both should have small natural drooping ears, fine glossy coats and tapering sterns. The toy variety of the former should be a miniature of the larger, and is very difficult to produce of first-class quality.

Scottish Terriers are very interesting, often with much "character" about them. The usual colours are black, shades of gray, or brindle, but some are seen fawn, stone-colour, and white. The ears should be carried bolt upright, the coat as hard as a badger's,

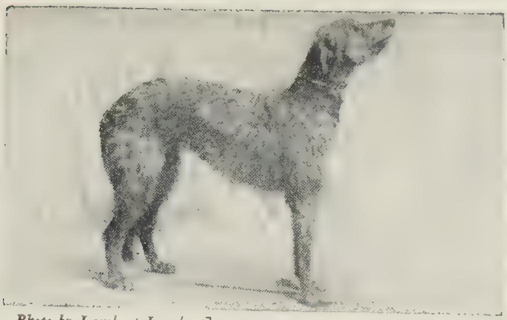


Photo by Lambert Lambert] [Bath

DEER-HOUND

This is a capital portrait of one of the best of this graceful variety

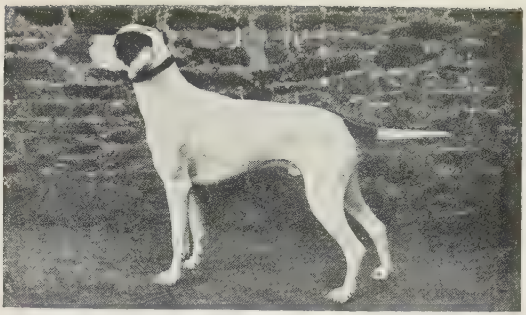


Photo by H. Cornish] [Crediton

POINTER

This is a young dog not yet shown, but full of quality and type

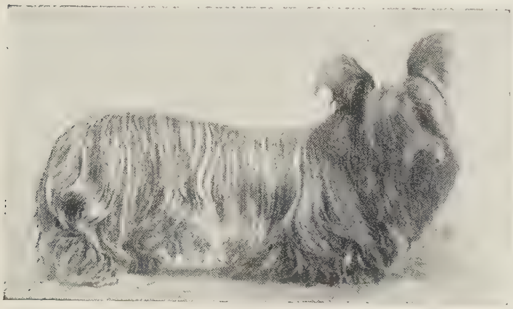


Photo by Villiers & Sons] [Newport

SKYE TERRIER

The photograph is of a well-known winner in show form

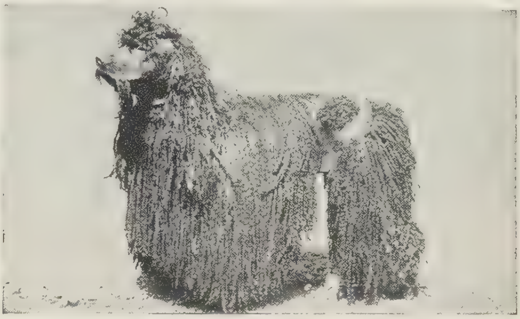
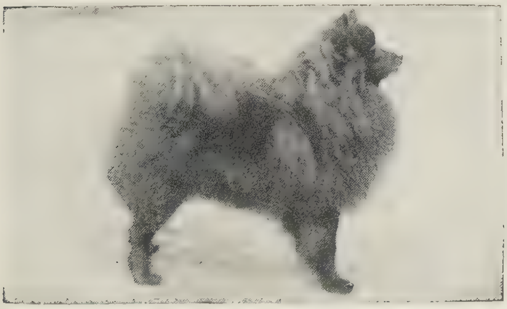


Photo by T. Fall] [Baker Street

CORDED POODLE

The length of the cords of which the coat is composed is clearly shown



By permission of Mrs. Hall-Walker

POMERANIAN

Probably about the best all-black Toy Pomeranian ever shown

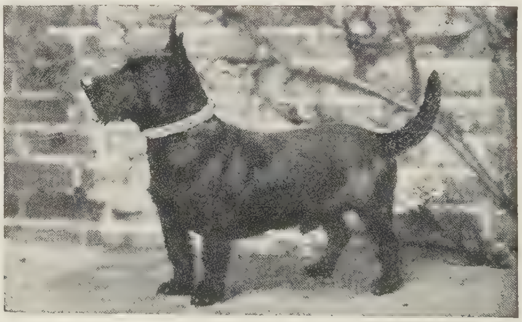


Photo by Kitchener & Salmon] [Bond Street

SCOTTISH TERRIER

A smart picture of one of the best of these popular dogs

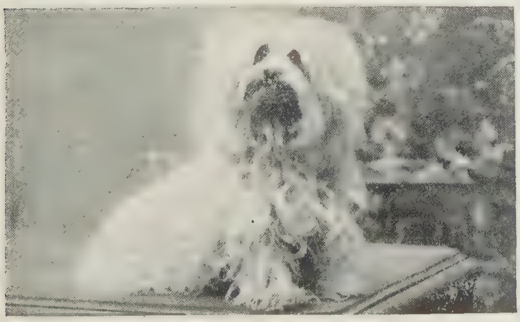


Photo by G. N Taylor] [Cowley Road

MALTESE TOY TERRIER

A very excellent representation of one of the best specimens of the present day

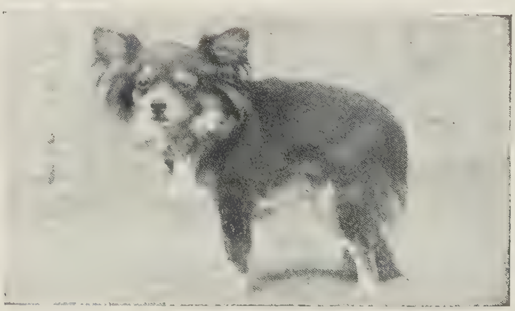
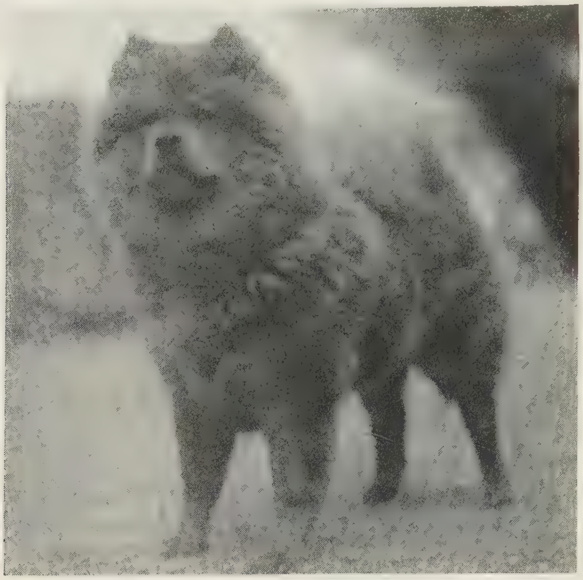


Photo by E. Landor] [Ealing

BUTTERFLY-DOG

The photograph gives an excellent idea of this somewhat rare variety



Photograph courtesy THE AMERICAN KENNEL CLUB

CHOW CHOW

teeth even, small dark expressive eyes, fore legs straight, the back short. One I brought from Skye many years since I took with me when driving some miles into the country; coming back by a different route, he missed me; but on nearing my starting-point I found him posted at a juncture of four roads, by one of which I must return. He could not have selected a better position. The illustration is that of a first-rate specimen of the variety, "Champion Balmacron Thistle."

Dandie Dinmont Terriers have many quaint and charming ways. They are very strongly built, being among the most muscular of the terriers, of high courage, devotedly attached to their owners, and admirably adapted for companions, being suitable for indoors or out, and at home anywhere. The colours are pepper (a sort of darkish iron-gray) and mustard (a yellowish red fawn), both with white silky hair on head, called the top-knot, and lustrous dark eyes, very gipsy-like and independent in expression.

Skyes, both Prick- and Drop-eared, are another Scottish breed which well deserve their popularity, as they are thorough sporting animals. The colours are chiefly shades of dark or light gray, but sometimes fawn with dark points and whites are seen. The texture of coat should be hard and weather-resisting; the eyes dark and keen in expression; bodies long, low, and well knit; legs straight in front; even mouths; tails carried gaily, but not curled over the back.

Schipperkes are of Belgian origin. To those who do not know them, they are something like medium-sized Pomeranians, short of coat, but without tails. They are nearly always pure black in colour, with coats of hardish texture, fullest round the neck and shoulders, the ears standing straight up like darts, short cobby bodies, and straight legs. They make smart guards and companions.

Chows originally came from China, but are now largely bred here. They are square-built sturdy dogs, with dense coats, tails carried over the side, blunt-pointed ears, and rather short thick heads. They have a little of a large coarse Pomeranian, with something of an Eskimo about them, but are different from either, with a type of their own. The colour is usually some shade of red or black, often with a bluish tinge in it. One marked peculiarity is that the tongues of chows are blue-black in colour.

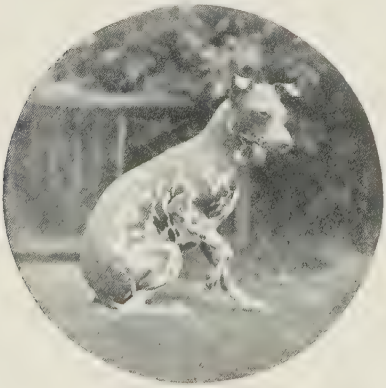


Photo by T. Fall] [*Baker Street*

SAND-DOG

A quaint picture of a quaint variety, quite hairless, and much the colour of Castile soap

Pomeranians can be procured of any weight from 3 to 30 lbs., and of almost every shade of colour. At present brown of various shades is much in favour, but there are many beautiful whites, blacks, blues, sables, and others. They are very sharp and lively, and make charming pets and companions. Really good specimens command high prices. The illustration is of one of the best of his colour ever seen—"Champion Pippin."

Pugs, both fawn and black, are old-fashioned favourites very quaint and peculiar in appearance. They should have square heads and muzzles, with small ears, large protruding eyes, short thick bodies, and tails tightly curled over the back. The illustration, "Duchess of Connaught," is of a well-known winner.

Maltese Terriers are very beautiful when pure bred. They have a long straight coat of silky white hair nearly reaching the ground, black nose and eyes, and the tail curled over the back of their short cobby body. Their beauty well repays the trouble of keeping them in good condition. The illustration, from a photograph taken for this article, is that of the high-class dog "Santa Klaus."

Yorkshire Toy Terriers, with their steel-blue bodies and golden-tanned faces, legs, and lower parts, and long straight coats, require skilful attention to keep in order, but are very attractive as pets.

Toy Spaniels are very old members of the toy division, dating from or before the time of King Charles: King Charles Spaniels being black and tan; Prince Charles Spaniels black, white, and tan; another strain, the Blenheim, white, with shades of reddish-tan markings on the head and body, and a spot of same colour on forehead; and the Ruby, a rich coppery red all over. They should be small and stout in size and shape, without coarseness, long in the ear, with large full protruding eyes of dark colour, a short face, a straight coat, and not leggy.

Photo by County of Gloucester Studio, Cheltenham

PUG AND PEKINESE SPANIEL

A typical portrait of two well-known winners in these popular varieties

Japanese Spaniels carry heavy coats, usually black, or yellow, and white in colour, shorter in the ears, which are carried more forward than in the last-named, broader in the muzzle, with nearly flat faces, dark eyes, and bushy tails carried over the back. They have very short legs, and their hair nearly reaches the ground as they walk. When I kept them they were much larger in size, but they are often now produced under 6 lbs. in weight.

Pekin Spaniels, the last of the toy spaniels I need mention, come from China. They should have soft fluffy coats, tails inclined to turn over the back, short faces, broad muzzles, large lustrous eyes, and a grave, dignified expression. The colour is usually some shade of tawny fawn or drab, but I have seen them black and dark brown; whatever colour, it should be without white. The illustration, Mrs. Lindsay's "Tartan Plaid," was one of the early importations.

Photo by C. Reid] [*Wishaw, N. B.*

FOX-TERRIER

A picture full of life and go—at present odds in favour of our friend with the prickly coat

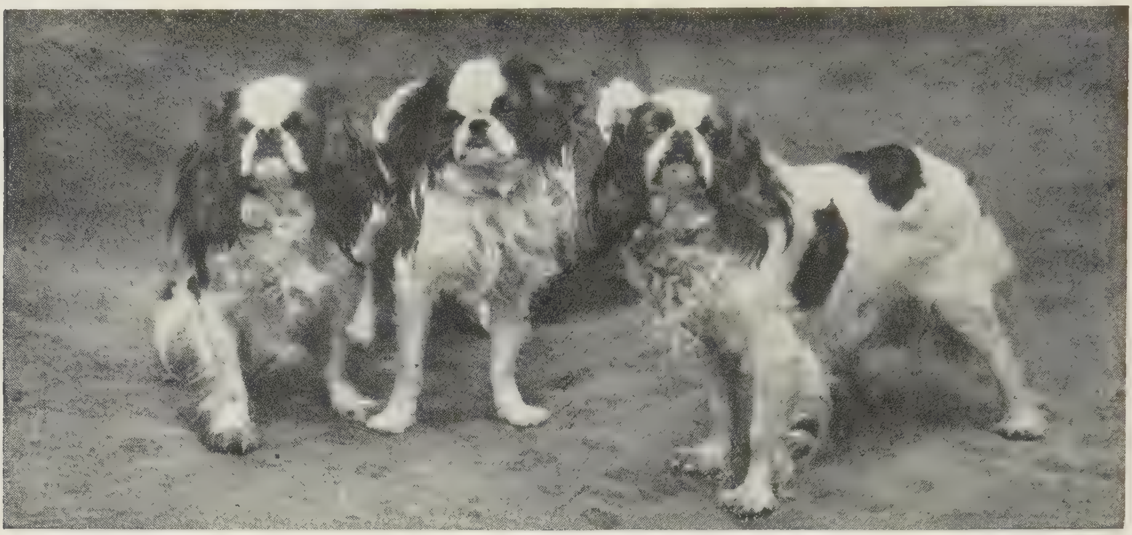


Photo by E. Landor] [*Ealing*

BLENHEIM AND PRINCE CHARLES SPANIELS

This little group will serve to show the appearance of these charming little pets

ITALIAN GREYHOUNDS, another old-fashioned variety of toy dog, should not exceed 12 lbs. in weight, but in my opinion are better if they are some pounds less. Much like miniature greyhounds in shape and build, they are elegant, graceful little creatures, very sensitive to cold. Shades of fawn, cream, or French gray are most common; but some are slate-blue, chestnut-red, and other tints. Of late years the breed has met with more encouragement, and there is less fear of its being allowed to die out.

GRIFFONS BRUSSELOIS have been greatly taken up the last few years. They are something like Yorkshire toy terriers in size and shape, but with a shortish harsh coat, generally of some shade of reddish brown, very short face, small shining dark eyes, heavy under-jaw, short thick body, and an altogether comical appearance. Imported specimens, particularly before reaching maturity, are often difficult to rear.

The AFRICAN SAND-DOG occasionally seen in this country (mostly at shows) is remarkable for being entirely hairless, except a few hairs of a bristly character on the top of the head and a slight tuft at the end of the tail; it is chiefly blue-black or mottled in colour, something in shape and size like a coarse black-and-tan terrier, and very susceptible to cold.

Having been supplied with an illustration of PARIAH PUPPIES, I will say a few words about this variety, which is seen in large numbers at Constantinople and other Eastern cities, where they roam about unclaimed, and act as amateur scavengers; they are said to divide the places they inhabit into districts or beats, each with its own leader, and resent any interference with their authority. I have known cases where they have made a determined attack on travelers out late at night; but they are rather a cowardly race, and easily repulsed with a little firmness on the part of the attacked. Probably these are the descendants of the dogs so often mentioned in Scripture with opprobrium; and, among Eastern peoples, to call a man "a dog" is even now the most insulting epithet that can be used. By the Jews, in ancient times, the dog never seems to have been used, as with us, in hunting and pursuing game and wild animals, but merely as a guardian of their flocks, herds, and sometimes dwellings.

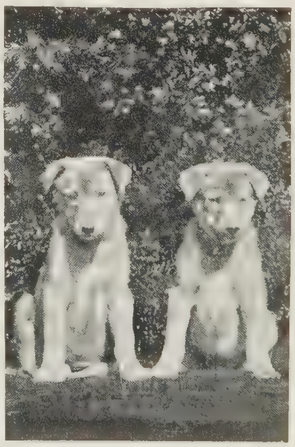


Photo by the Duchess of Bedford, Woburn Abbey

PARIAH PUPPIES

This capital photograph of a variety seldom seen in this country will be very interesting

CHAPTER VI

THE BEARS

Photo by Ottomar Anschütz, Berlin

AN INVITING ATTITUDE

The upright position is not natural to the brown bear. It prefers to sit on its hams, and not to stand

EXCEPT the great cats, no creatures have longer held a place in human interest than the BEARS. Their size and formidable equipment of claws and teeth give the touch of fear which goes with admiration. On the other hand, they do not, as a rule, molest human beings, who see them employing their great strength on apparently insignificant objects with some amusement. Except one species, most bears are largely fruit and vegetable feeders. The sloth-bear of India sucks up ants and grubs with its funnel-like lips; the Malayan bear is a honey-eater by profession, scarcely touching other food when it can get the bees' store; and only the great polar bear is entirely carnivorous. The grizzly bear of the Northern Rocky mountains is largely a flesh eater, consuming great quantities of putrid salmon in the Columbian rivers. But the ice-bear is ever on the quest for living or dead flesh; it catches seals, devours young sea-fowl and eggs, and can actually kill and eat the gigantic walrus.

Every one will have noticed the deliberate flat-footed walk of the bears. This is due partly to the formation of the feet themselves. The whole sole is set flat upon the ground, and the impressions in a bear's track are not unlike those of a man's footsteps. The claws are not capable of being retracted, like those of the Cats; consequently they are worn at the tips where the curve brings them in contact with the ground. Yet it is surprising what wounds these blunt but hard weapons will inflict on man—wounds resembling what might be caused by the use of a very large garden-rake. Against other animals protected by hair bears' claws are of little use. Dogs would never attack them so readily as they do were they armed with the talons of a leopard or tiger. The flesh-teeth in both jaws of the bear are

Photo by Fratelli Alinari] *[Florence*

THREE PERFORMING BEARS

Those on the right and left are Himalayan black bears. The white collar is plainly seen unlike those of other carnivora. The teeth generally show that bears have a mixed diet. Bears appear to have descended from some dog-like ancestor, but to have been much modified.

Except the ice-bear, all the species are short and very bulky. It is said that a polar bear has been killed which weighed 1,000 lbs. It is far the largest, and most formidable in some respects, of all the carnivora. The claws of the grizzly bear are sometimes 5 inches long over the outer curve. All bears can sit upright on their hams, and stand upright against a support like a tree. Some can stand upright with no aid at all. Except the grizzly bear, they can all climb, many of them very well. In the winter, if it be cold, they hibernate. In the spring, when the shoots of the early plants come up, they emerge, hungry and thin, to seek their food. Bears were formerly common in Britain, and were exported for the Roman amphitheatres. The prehistoric cave-bears were very large. Their remains have been found in Devon, Derbyshire, and other counties. The species inhabiting Britain during the Roman period was the common brown bear of Europe.

Photo by Ottomar Anschütz] [*Berlin*

EUROPEAN BROWN BEAR

The specimen of the brown bear of Europe from which this picture was taken was an unusually light and active bear. Its flanks are almost flat

The Common Brown Bear.

Only one species of bear is found in Europe south of the ice-line, though above it the white ice-bear inhabits Spitzbergen and the islands off the White Sea. This is the Brown Bear, the emblem of Russia in all European caricature, and the hero of innumerable fragments of folklore and fable, from the tents of the Lapps to the nurseries of American children. Except the ice-bear, it is far the largest of European carnivora, but varies much in size. Russia is the main home of the brown bear, but it is found in Sweden and Norway, and right across Northern Asia. It is also common in the Carpathian Mountains, in the Caucasus, and in Mount Pindus in Greece. In the South it is found in Spain and the Pyrenees, and a few are left in the Alps. The dancing-bears commonly brought to England and America are caught in the Pyrenees. The "Queen's bear," so called because its owner was allowed to exhibit it at Windsor, was one of these. But lately dancing-bears from Servia and Wallachia have also been seen about our roads and streets. In Russia the bear grows to a great size. Some have been killed of 800 lbs. in weight. The fur is magnificent in

Photo by E. Landor] [Ealing

SYRIAN BEAR

This is the bear generally alluded to in the Old Testament

winter, and in great demand for rich Russians' sledge-rugs. The finest bear-skins of all are bought for the caps of the Grenadier and Coldstream Guards. In the Alps the bears occasionally visit a cow-shed in winter and kill a cow; but as a rule the only damage done by those in Europe is to the sheep on the hills in the far north of Norway. Tame brown bears are amusing creatures, but should never be trusted. They are always liable to turn savage, and the bite is almost as severe as that of a tiger. Men have had their heads completely crushed in by the bite of one of these animals. In Russia bears are shot in the following manner. When the snow falls, the bears retire into the densest thickets, and there make a half-hut, half-burrow in the most tangled part to hibernate in. The bear is tracked, and then a ring made round the cover by beaters and peasants. The shooters follow the track and rouse the bear, which often charges them, and is forthwith shot. If it escapes, it is driven in by the beaters outside. High fees are paid to peasants who send information that a bear is harboured in this way. Sportsmen in Petrograd will go 300 or 400 miles to shoot one on receipt of a telegram.

Photo by W. D. Dando] [Regent's Park

LARGE RUSSIAN BROWN BEAR

The picture shows to what a size and strength the brown bear attains

A Siberian peasant who wished to do a little hunting on his own account had a lively adventure. The bear had the best of it, knocked him down, and so frightfully mangled his arm that he fainted. Bruin then buried him in orthodox bear fashion; and the man, when he came to, which he fortunately did before the bear came back, got up, and made his way to the village. There he was for a long time ill, and all through his sickness and delirium talked of nothing but shooting the bear. When he got well, he disappeared into the forest with his gun, and after a short absence returned with the bear's skin!

THE SYRIAN BEAR.

This bear, which figures in the story of Elisha, is a variety of the brown bear. It is found from the Caucasus to the mountains of Palestine, and is a smaller animal than the true brown bear, weighing about 300 lbs. The fur in summer is of a mixed rusty colour, with a whitish collar on the chest. It steals the grapes on Mount Horeb, and feeds upon ripe fruits, apples, chestnuts, corn, and the like. It is then ready to face the long winter sleep.

The Indian Sloth-bear.

Few people would believe that this awkward and ugly beast is so formidable as it is. It is the commonest Indian species, seldom eats flesh, prefers sucking up the contents of a white ants' nest to any other meal, and is not very large; from 200 lbs. to 300 lbs. is the weight of a male. But the skull and jaws are very strong, and the claws long and curved. As they are used almost like a pickaxe when the bear wishes to dig in the hardest soil, their effect upon the human body can be imagined.

Sir Samuel Baker says that there are more accidents to natives of India and Ceylon from this species than from any other animal.

Mr. Watts Jones writes an interesting account of his sensations while being bitten by one of these bears: "I was following up a bear which I had wounded, and rashly went to the mouth of a cave to which it had got. It charged. I shot, but failed to stop it. I do not know exactly what happened next, neither does my hunter who was with me; but I believe, from the marks in the snow, that in his rush the bear knocked me over backwards—in fact, knocked me three or four feet away. When next I remembered anything, the bear's weight was on me, and he was biting my leg. He bit two or three times. I felt the flesh crush, but I felt no pain at all. It was rather like having a tooth out with gas. I felt no particular terror, though I thought the bear had got me; but in a hazy sort of way I wondered when he would kill me, and thought what a fool I was to get killed by a stupid beast like a bear. The shikari then very pluckily came up and fired a shot into the bear, and he left me. I felt the weight lift off me, and got up. I did not think I was much hurt. . . . The main wound was a flap of flesh torn out of the inside of my left thigh and left hanging. It was fairly deep, and I could see all the muscles working underneath when I lifted it up to clean the wound." This anecdote was sent to Mr. J. Crowther Hirst

Photo by C. Reid] [*Wishaw, N.B.*

A BROWN BEAR IN SEARCH OF INSECTS

The photograph shows a bear feeding on insects, possibly large ants, which he licks up from the ground, after scratching them out with his claws to illustrate a theory of his, that the killing of wild animals by other animals is not a painful one.

Rustem Pasha, once Turkish Ambassador in England, had an accident when brown bear shooting in Russia, and writes of it in the same sense: "When I met the accident alluded to, the bear injured both my hands, but did not tear off part of the arm or shoulder. In the moment of desperate struggle, the intense excitement and anger did, in fact, render me insensible to the feeling of actual pain as the bear gnawed my left hand, which was badly torn and perforated with holes, most of the bones being broken."

There is good reason to believe that when large carnivora, or beasts large in proportion to the size of their victims, strike and kill them with a great previous shock, the sense of pain is deadened. Not so if the person or animal is seized quietly. Then the pain is intense, though sometimes only momentary. A tigress seized Mr. J. Hansard, a forest officer in Ceylon, by the neck. In describing his sensations afterwards, he said: "The agony I felt was something frightful. My whole skull seemed as if it were being crushed to atoms in the jaws of the great brute. I certainly felt the most awful pain as she was biting my neck; but not afterwards, if I can remember." Sir Samuel Baker says he has twice seen the sloth-bear attack a howdah-elephant. Lord Edward St. Maur, son of the Duke of Somerset, was killed by one. Mr. Sanderson, the head of the Government Elephant-catching Department, used to hunt bears in the jungle with bull-terriers. Against these the bear was unable to make a good fight. They seized it by the nose; and as its claws were not sharp like those of the leopard, the bear could not get them off.

Photo by Fratelli Alinari] [*Florence*

POLAR BEARS

Though Arctic animals, polar bears can endure great heat. During a "heat wave" at Hamburg, Herr C. Hagenbeck found two of his leopards suffering from heat apoplexy, but the polar bears were enjoying the sun

This bear seldom produces more than two or three young at a birth. The young cub is very ugly, but very strong, especially in the claws and legs. A six weeks' old cub has been turned upside-down in a basket, which was shaken violently, without dislodging the little animal clinging inside.

The Isabelline Bear and Himalayan Black Bear.

The former animal is a medium-sized variety of the brown bear. The coat in winter is of a beautiful silver-tipped cinnamon colour. The Himalayan Black Bear has a half-moon of white on its throat. The habits of both do not differ markedly from those of the brown bear of Europe.

Recently black bears have been most troublesome in Kashmir, attacking and killing and wounding the wood-cutters with no provocation. Dr. E. T. Vere, writing from Srinagar, says: "Every year we have about half a dozen patients who have been mauled by bears. Most of our people who are hurt are villagers or shepherds. Bears have been so shot at in Kashmir that, although not naturally very fierce, they have become truculent. When they attack men, they usually sit up and knock the victim over with a paw. They then make one or two bites at the arm or leg, and often finish up with a snap at the head. This is the most dangerous part of the attack. One of our fatal cases this year was a boy, the vault of whose skull was torn off and lacerated. Another man received a compound fracture of the cranium. A third had the bones of his face smashed and lacerated. He had an axe, but said, 'When the bear sat up, my courage failed me.'"

The Malayan Sun-bear.

These small, smooth-coated bears have a yellow throat-patch like a mustard plaster, and are altogether the most amusing and comical of the tribe. They are almost as smooth as a pointer dog, and are devoted to all sweet substances which can be a substitute for honey, their main delicacy when wild. There are always a number of these bears at the Zoo incessantly begging for food. When one gets a piece of sugar, he cracks it into small pieces, sticks them on the back of his paw, and licks the mess until the paw is covered with sticky syrup. which he eats with great gusto. This bear is found in the Malay Peninsula, Borneo, Sumatra. and Java. It is only 4 feet high, or sometimes half a foot taller. It is more in the habit of walking upright than any other species.

CHAPTER VII.

THE SMALLER CARNIVORA.

THE COATIS.

THE COATIS are small arboreal creatures, with the habits of a raccoon and squirrel fairly proportioned. They are flesh-eaters, but active and playful. Their long pig-like snouts give them an unpleasant appearance. They inhabit Mexico and Central and South America as far as Paraguay. Several specimens are generally to be seen at the Zoological Gardens. Their habits are much the same as those of the small tree climbing cats, but with something of the badger added. Insects and worms, as well as birds and small animals, form their food.

THE PANDAS AND KINKAJOU.

Among the small carnivorous mammals the BEAR-CAT, or PANDA, is a very interesting creature. Its colour is striking—a beautiful red-chestnut above, the lower surface jet-black, the tail long and ringed. The quality of the fur is fine also. It is found in the Eastern Himalaya, and is as large as a badger. The GREAT PANDA, from Eastern Tibet, is a much larger, short-tailed. black-and-white animal, once thought to be a bear. The KINKAJOU has a prehensile tail, and uses its paws as hands so readily that it was formerly placed among the lemurs. It is a native of Southern and intertropical America. Nocturnal, and living in the great forests, it is seldom seen by man. Its head is round and cat-like, its feet are the same, but with non-retractile claws, and it has a long, full tail. It has a long tongue, with which it can lick out insects from the crevices and holes of trees. Baron von Humboldt says that it attacks the nests of wild bees. It uses its tongue to draw objects of food towards it, even if they are not living. A pleasant description of this animal appeared in Charles Knight's "Museum of Animated Nature," published many years ago: "In its aspect there is something of gentleness and good-nature.

Photo by A. S. Rudland & Sons

GREAT PANDA

This very rare animal is found on the high plateau of Tibet

Photo by Scholastic Photo Co., Parson's Green

KINKAJOU

The kinkajou eats birds and eggs as well as honey and fruit. One kept in South America killed a whole brood of turkeys, and was partial to birds' eggs.

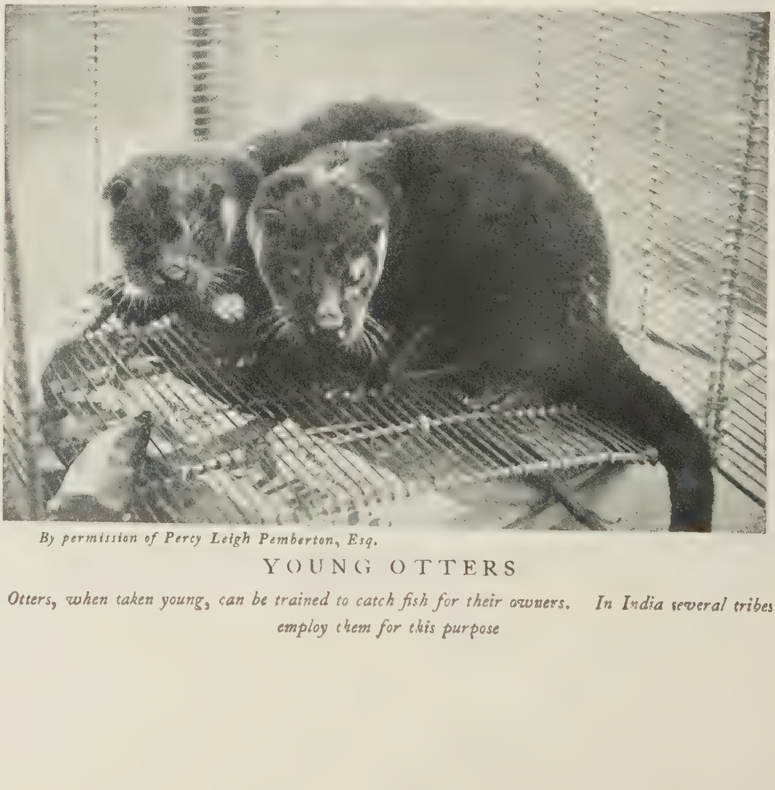
In captivity it is extremely playful, familiar, and fond of being noticed. One lived in the gardens of the Zoological Society for seven years. During the greater part of the morning it was asleep, rolled up in a ball in its cage. In the afternoon it would come out, traverse its cage, take food, and play with those to whom it was accustomed. Clinging to the top wires of its cage with its tail and hind paws, it would thus swing itself backwards and forwards. When thus hanging, it would bring its fore paws to the bars, as well as the hind pair, and in this manner would travel up and down its cage with the utmost address, every now and then thrusting out its long tongue between the wires, as if in quest of food, which, when offered to it, it would endeavour to draw in between the wires with this organ. It was very fond of being gently stroked and scratched, and when at play with any one it knew it would pretend to bite, seizing the hand or fingers with its teeth, as a dog will do when playing with its master. As the evening came on, it was full of animation, and exhibited in every movement the most surprising energy."

THE OTTERS.

As the badgers and ratels seem especially adapted to an underground and cave-making existence, so the Otters all conform in structure to an aquatic life; yet, except the webbing of the space between the toes and the shortening and flattening of the head, there is very little obvious change in their structure to meet the very great difference in the conditions under which they live.

The Short-toed Otter is a small Indian species. It has nails on its hands in place of claws. One kept at the Zoo was a most amusing and friendly little pet, which let itself be nursed like a kitten.

The Common Otter is far the most attractive of the British carnivora. It is still fairly common all over Britain where fish exist. It is found on the Norfolk broads and rivers, all up the Thames, in Scotland, Devonshire, Wales, Cumberland, and Northumberland. It travels considerable distances from river to river, and sometimes gets into a preserved trout-pool or breeding-pond, and does much mischief. The beautiful young otters here figured are in Mr. Percy Leigh Pemberton's collection of British mammals. Their owner made a large brick tank for them, where



By permission of Percy Leigh Pemberton, Esq.

YOUNG OTTERS

Otters, when taken young, can be trained to catch fish for their owners. In India several tribes employ them for this purpose they were allowed to catch live fish. Once one of them seized a 4-lb. pike by the tail. The pike wriggled round and seized the otter's paw, but was soon placed *hors de combat.* The largest otter which the writer has seen was bolted by a ferret from a rabbit-warren on the edge of the Norfolk fen at Hockwold, and shot by the keeper, who was rabbiting.

English dog otters sometimes weigh as much as 26 lbs. They regularly hunt down the rivers by night, returning before morning to their holt, where they sleep by day. No fish stands a chance with them. They swim after the fish in the open river, chase it under the bank, and then corner it, or seize it with a rush, just as the penguins catch gudgeon at the Zoo. Captain Salvin owned a famous tame otter which used to go for walks with him, and amuse itself by catching fish in the roadside ponds.

TWO TAME OTTERS

These two little otters were photographed by the Duchess of Bedford. Alluding to the old signs of the zodiac and their fondness for the watering-pot, their portrait was called "Aquarius" and "The Twins."

THE BADGERS.

The Badgers include several genera. The Sand-badgers of the East have a naked snout, small ears, and rough fur, with softer fur underneath. The Indian Badger is larger than that of Europe, while that of Java, Sumatra, and Borneo is smaller, and has a very short tail.

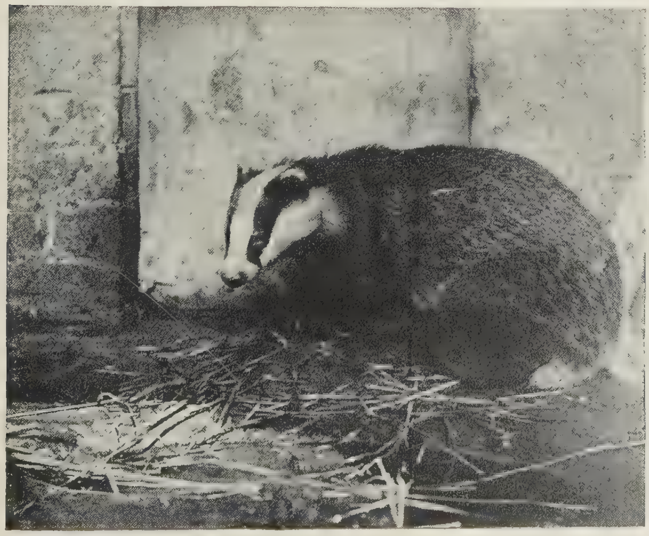


Photo by Scholastic Photo. Co.] [Parson's Green

EUROPEAN BADGER

Badgers can be readily kept in confinement, and are not difficult to tame thoroughly

The Ferret-badgers from the East have elongated bodies and short tails. They are tree-climbers, and as omnivorous as the badger itself. The Cape Zorilla, with another species found in Egypt, is more nearly allied to the polecats, but is striped like a skunk.

The European Badger is still fairly numerous. There is not a county in England where it is not found. A large colony has been established in Epping Forest, some fifty yards square of hill-side being honeycombed with badger-earths. The European badger is found all over temperate Northern Europe and Asia; but being shy, wary, and mainly nocturnal, is seldom seen. At night it wanders about, and in August gets into the corn-fields, whence it is chased and caught by dogs. A Somersetshire farmer had a pointer and sheep-dog which were adepts at this night catching of badgers. They would accompany their master along the roads, and the pointer instantly winded any badger which had crossed. Both dogs then bounded off, and soon their loud barking showed that they had found and "held up" the badger. The dogs' owner then came up, picked the badger up by its tail, and dropped it in a sack. The badger's "earth" is wonderfully deep and winding; in it the badger sleeps during the winter, and gives birth to its young, three or four of which are produced at a time. The end of March is the period of birth, but the cubs do not come out until June. In October they are full-grown. The badger carries in a great quantity of fern and grass as a bed for its cubs. Mr. Trevor-Battye writes: "I had a pair which were probably about six weeks old. They were called Gripper and Nancy. They would rest on my lap when feeding, and sit up and beg like dogs. Their hearing and power of scent were remarkable. The badgers were in a closed yard; but if any of the dogs came near, even following a path which ran at a distance of six or seven yards, they would instantly jump off my lap and disappear into a corner. The animals could walk and trot *backwards* with the greatest ease." I have never seen this noticed elsewhere, yet it is worth mentioning, because it is characteristic of the Weasel Family, not being shared, to my knowledge, by any other mammal—not, for instance, by the Bears.

Photo by C. Reid] [*Wishaw, N.B.*

A BADGER IN THE WATER

They are nocturnal animals

Mr. A. E. Pease says of the badger: "It is easily domesticated, and if brought up by hand is found an interesting and charming companion. I had at one time two that I could do anything with, and which followed me so closely that they would

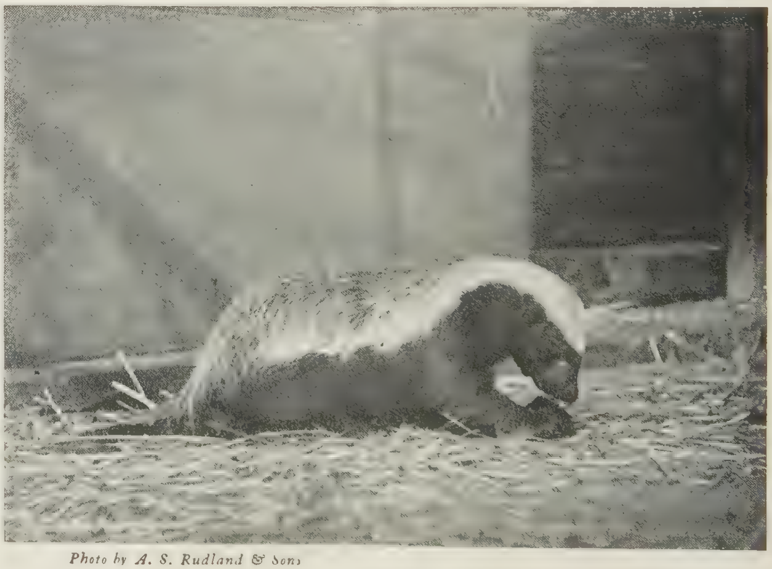


Photo by A. S. Rudland & Sons

RATEL

Ratels are curiously restless little animals, with a peculiar trot-like walk bump against my boots each step I took, and come and snuggle in under my coat when I sat down."

THE RATELS.

As the mink is adapted for an aquatic diet, so the RATELS, a link between the Weasels and the Badgers, seem to have been specialised to live upon insects and honey as well as flesh. They are quaint creatures, with rounded iron-gray backs, and black bellies, noses, and feet. The African kind is found in Cape Colony and East Africa, and is believed to live largely on honey and bee-brood. The habits of the ratel are almost identical with those of the badger, except that it is less shy and very restless. A nearly similar species of ratel is found in Southern Asia from the Caspian to India.

The ratels are strictly nocturnal, and make their lair by day in hollow trees, though they are said not to climb. The skin is protected by thick, close hair, so that bees cannot sting through the fur. The skin is also very loose. If a dog bites it, the ratel can generally twist round and bite back. The African ratel is omnivorous. It eats snakes and birds. The body of a cobra has been found in the stomach of one.

THE WEASEL TRIBE.

THE MARTENS.

There are two species of marten in Europe—the BEECH- and the PINE-MARTEN. The latter has a yellow throat, the former a white one. The fur is almost as fine as sable. All so-called Canadian sables are really martens. These animals are found throughout Northern Europe and Northern Asia, and also in Japan. It is a tree-loving animal, and feeds mainly on squirrels, which it pursues through the branches. It is also fond of fruit. Mr. Charles St. John discovered this in a curious way. He noticed that his raspberries were being stolen, so set a trap among the canes. Next day all he could see was a heap of newly gathered raspberry leaves where the trap was. Stooping down to move them, a marten sprang up and tried to defend itself. The poor beast had come to gather more raspberries, and had been caught. Unable to escape, it gathered the leaves near and concealed itself.

THE SABLE.

This is so little different from the marten that some have thought it only a northern variety. That is not the case, as both are found in the same area, and no one who knows anything of form and colour could mistake the true sable's fur. This fur is so fine and even that each single hair tapers gradually to a point: that is why sable brushes for painting are so valuable; they always form a point when wet. The price of these brushes, which are of genuine sable fur, though made up from fragments of the worst coloured or damaged skins, varies yearly with the price of sable in the market.

THE POLECAT.

This is now probably the rarest of the European weasels. It is almost identically the same as the polecat-ferret, a cross-breed between it and the domesticated variety. It is an expert swimmer. Its habits are the same as those of the stoat, but it is slower in its movements. It catches fish, and can pick up food from the bottom of the water. Wild ones can be trained to work like ferrets. "They do not delay in the hole, but follow the rat out and catch it in a couple of bounds" (Trevor-Battye). The FERRET is a domesticated breed of polecat. It is identical in shape and habits, but unable to stand a cold climate.

CHAPTER VIII.

MARINE CARNIVORA: THE SEALS, SEA-LION, AND WALRUS.

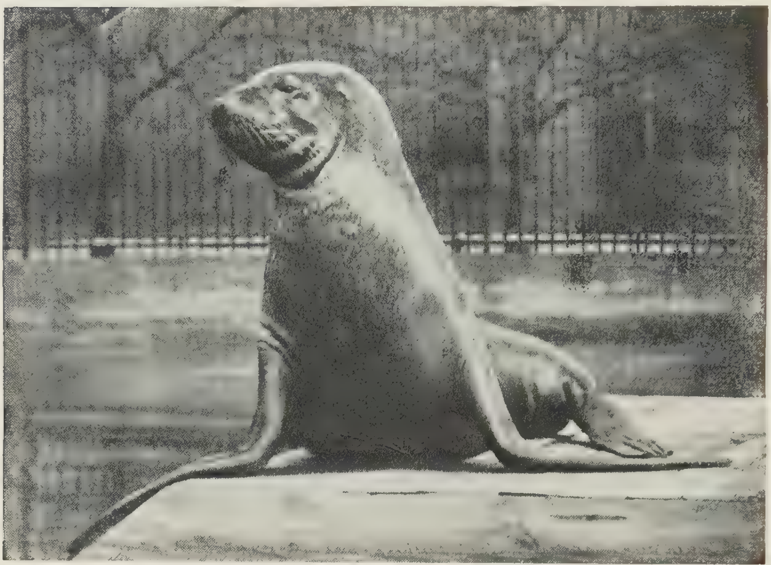


Photo by G. W. Wilson & Co., Ltd.) *[Aberaeen*

STELLER'S SEA-LION

The eared seal, or sea-lion, has the hind flippers divided, and is thus able to move with comparative ease on land

THERE are three families of the Sea Carnivora,—the Fur-seals, or Eared Seals; the Walrus; and the True or Earless Seals.

The first group, which are called Eared Seals, and occasionally Sea-lions and Sea-bears, have a small outer ear, and when on land the hind flippers are folded forwards beneath the body. There is a distinct neck, and on the flippers are rudimentary claws. Some of the eared seals have the close and fine under-fur which makes their capture so remunerative. Under the skin there is often a thick layer of blubber, which is also turned to commercial uses by the sealers.

The Walrus stands by itself. It is a purely Arctic species, whereas fur-seals are found from Bering Sea to the Antarctic; and forms in some degree a connecting link between the eared seals and the true seals. Like the former, it turns the front flippers forwards and inwards when on land; but it resembles the true seals in having no external ears. The upper canine teeth are developed into enormous tusks of hard ivory.

The Common Seals are the most thoroughly aquatic. The hind flippers seem almost to have coalesced with the tail, and are always directed backwards in line with it. They have no under-fur. On land they can only use the front flippers to aid their progress.

Most seals are marine, though some are found in the land-locked sea of Lake Baikal, in Central Asia, and the true seals often come up rivers.

The Eared Seals, or Sea-lions.

These and the walrus have their hind limbs so far free that they can crawl on land and use their flippers for other purposes than swimming; they can comb their hair with them, and walk in an awkward way. They are divided into the fur-seals and hair-seals in the language of trade. The fur-seals are those from which ladies' sealskin jackets are made; the hair-seals are sought for their hides and oil. A demand has sprung up for the latter to make coats for automobilists to wear when riding at high speed in cold weather. The "porpoise-hide" boots are really made from the skin of the hair-seal.

Both hair-seals and fur-seals have in common the remarkable habit of assembling in large herds during the breeding-season, and of spending a long period on land after the young are born. The male seals reach the islands, or "rookeries," first, followed by the females. The latter give birth to their young almost as soon as they reach the rocks, and are then seized and gathered into harems by the strongest and oldest males. The sea-lions of Patagonia, equally with the fur-seals of Bering Sea and the Pribyloff Islands, never feed during the whole time which they spend on the rocks, often for a period of two months.

The Fur-seals.

The Northern Fur-seal is the only member of this group surviving in any number. These animals still annually resort to the Aleutian Islands, in the territory of Alaska, in great herds to produce their young, and to certain other islets off the coast of Japan. This northern fur-seal, from the fur of which the sealskin jackets are obtained, is, when full grown, between 6 and 7 feet long. The females are only 4 feet or 4½ feet in length. The shoulder of the male is gray, the rest of the body varying between reddish gray and deep black. The female is lighter in colour. Males of this species are not full grown till six years of age, but breed when four years old. The females produce young at three years of age. The male seals take possession of the females almost immediately after reaching the breeding grounds, each male collecting as many females as it can round it The pups keep with their mothers. This assemblage is surrounded by great numbers of young male or bachelor seals, which the old males prevent from annexing any of the females. The greatest of all these gathering-places are on the Pribyloff Islands and certain other islets in Bering Sea. By the end of May both male and female seals swim in flocks through Bering Straits, making for the islands. The islands themselves are leased to American merchants. But as those seals killed on the way are all just about to bring forth young, the waste and cruelty of this "pelagic sealing" will be easily understood. On the islands, or "rookeries," the males, mothers, and pups remain till August, when the pups take to the water. The male seals have remained for at least two months, incessantly fighting and watching, without taking any food. By that time they are quite exhausted, the fat which they laid up previously being all absorbed. The fur has not naturally either the colour or texture

Photo by G. W. Wilson & Co., Ltd.] *[Aberdeen*

SEA-LION

This photograph shows the dry mane of the sea-lion, a rather uncommon sight, as it rarely remains long enough out of the water for its fur to become absolutely dry which art gives it. The outer fur is long and coarse, and only the inner fur of the exquisite texture of the "made" skin. The former is removed, and the latter dyed to the rich brown colour which we see. The fur-seals are steadily diminishing, and each year's catch is smaller than that of the year before.

The Cape Fur-seal, Southern Fur-seal, and New Zealand Fur-seal are practically extinct for commercial purposes.

The Hair-seals.

Among these are the large so-called "sea-lions" of Patagonia and the North Pacific. We are familiar with their appearance, because for many years specimens have been kept at the Zoological Gardens. Their habits are much the same as those of the fur-seals. The principal species are, in the north, Steller's Sea-lion, and the Patagonian Sea-lion in the south. Those kept at the Zoological Gardens are usually of the latter species.

By permission of Professor Bumpus] [*New York*

SEA-LION

All sea-lions are polygamous. The males guard their harems very jealously, and fight determinedly with any intruder

Steller's Sea-lion is already on the road to extinction. When the annual catch of fur-seals reached 100,000 a year, the total number of these northern sea-lions was estimated at between 30,000 and 40,000. They repair every year to the Pribyloff Islands to breed, as the fur-seals do, but are shier and more entirely aquatic. The fur of the old males is tawny, and makes a kind of mane over the shoulders, whence its name. Off San Francisco there is a small rocky island, one of the ancient "rookeries" of these sea-lions, where they are carefully preserved by the United States Government as one of the sights of the bay. Another favourite haunt in old days was on the Farralone Islands, thirty miles from the bay.

Southwards, towards the Antarctic, on the desolate and uninhabited coasts and islets of the Far Southern Ocean, the most characteristic of the fauna still remaining are the sea-lions. Formerly they swarmed in great packs, crowding at the breeding-season the seaweed-covered rocks with their huge and unwieldy forms, and at other times cruising in uncouth and noisy companies in search of the fishes and squids, which they pursued like packs of ocean-wolves. In spring the sea-lions used to struggle on to the flat shore, where the equally aquatic tribes of penguins, which had lost the use of their wings, covered acre after acre of rock with their eggs and young. These the sea-lions devoured. When the men of the first exploring-ships visited the penguins' nurseries, all the ungainly birds began to hop inland, evidently taking the men for seals, and thinking it best to draw them as far from their native element as possible. But the eared seals can make good progress of a kind on land. When Captain Musgrave and his crew were cast away for twenty months on the Auckland Islands, they found their tracks on the top of a hill four miles from the water. Captain Musgrave also saw the mother seals teaching their puppies to swim; they were by no means inclined to do this, and were afraid of the water—fairly clear presumptive evidence that seals have only recently, so far as natural time is counted, taken to the aquatic life, and modified their form so profoundly as they have.

The Patagonian Sea-lion is perhaps the most numerous species, though its numbers have been greatly reduced by whalers in search of skins and oil. The first sea-lion ever brought here was one of these. The Zoological Society did not import it; they found it in the possession of a Frenchman called Lecomte, who had taken it on the Patagonian coast, trained it, and brought it home, where he showed it in a caravan. Its training was long and difficult; it bit like a bull-dog, and Lecomte's limbs were scarred all over with its bites. In spite of this it was the cleverest performing animal ever seen up to that time in England. This sea-lion died from swallowing a fish-hook concealed in some fish with which it was fed. Lecomte was then sent out by the Zoological Society to obtain some more. With the greatest difficulty several were secured, but all died on the voyage to New York. Lecomte returned and obtained others, one of which he succeeded in bringing here. The cleverness of these animals—or rather their power of understanding what they are required to do, and their willingness to do it—probably exceeds that of any other animal, except the elephant and the dog. Why this is so is not easy to conjecture, except that the brain is more developed. They have been taught to fetch and carry on dry land like a retriever, in addition to the well-known tricks exhibited by those at the Zoo. One belonging to Barnum's Show caught strawberry-punnets on its nose when they were thrown to it, and waved a torch, which it held in its teeth and caught after tossing it into the air.

The sea-lions are much more powerful animals than the fur-seals. The male of Steller's sea-lion attains a length of 10 feet and a weight of 1,000 lbs. The AUSTRALIAN SEA-LION is even larger than that of the North Pacific. Some specimens are said to attain 12 feet in length. Captain Cook mentions seeing male Patagonian sea-lions 14 feet long and from 8 to 10 feet in circumference. Though none are now seen of such dimensions, skulls found on the beach show that anciently some of the sea-lions were larger than any now known.

It should be noted that all these creatures are carnivorous, yet the supply of food for them never seems to fail, as undoubtedly it would were the animals dependent for their food on land

By permission of Herr Carl Hagenbeck] *[Hamburg*

FEMALE WALRUS

This is a photograph of the only walrus which has ever been tamed and taught to perform tricks. It was taken when she was two years old and weighed 380 lbs. At that time she consumed 70 lbs. of boneless fish a day; a year later not less than 100 lbs. satisfied her. She is now an inmate of the Roumanian Zoological Gardens

By permission of the Hon. Walter Rothschild] [Tring

MALE WALRUS

The "tusks" of the walrus are put to many practical uses during life, and after death are much valued for the ivory

THE WALRUS.

The distinguishing features of the walrus have been mentioned in the introductory remarks to this chapter. It should be added that it has an external ear-passage, though no external ears, and very thick and bristly whiskers. It is practically confined to the Arctic Circle, though once its range extended to the British coasts (where its bones are found in the Suffolk Crag) and to Virginia. The skull of one was found in the peat at Ely—evidence that it once ascended rivers.

The walrus stands alone; it is a real monster of the deep. Strange and awful stories were told of it by some of the early voyagers to the Arctic Seas; but Captain Cook gave a very different account of his impressions of the walruses which he saw on the north coast of America: "They lie in herds of many hundreds on the ice, huddling over one another like swine. (They lie just like a lot of pigs in a yard.) They roar and bray so very loud, that in the night, or in foggy weather, they gave us notice of the vicinity of the ice before we could see it. We never found the whole herd asleep, some being always on the watch These, on the approach of the boat, would awaken those next to them; and the alarm being thus gradually communicated, the whole herd would awake presently. But they were seldom in a hurry to get away, till after they had been once fired at; they then would tumble over one another into the sea in the utmost confusion They did not appear to us to be that dangerous animal which authors have described, not even when attacked. Vast numbers of them would follow us, and come close up to the boats; but the flash of the musket in the pan, or the bare pointing of it, would send them down in an instant. The female will defend her young to the last, and at the expense of her own life, whether in the water or upon the ice; nor will the young one quit the dam, though she be dead; so that if one be killed the other is certain prey." The long pendent tusks, bristly whiskers, small bloodshot eyes, and great size lent colour to the terrifying tales of the walrus. But more ancient voyagers than Captain Cook told the truth—that the "morses," as they called them, were harmless creatures, which often followed the ships from sheer curiosity. They sleep on the ice like elephantine pigs, and dive and rout on the sea-bottom for clams, cuttle-fish, and seaweeds. Probably the long tusks are used to rake up mussels and clams; they also help the walrus to climb on to the ice. A young walrus was kept for some time by the members of the Jackson-Harmsworth Expedition, and was found to be an amusing pet. One kept on board a Dundee whaler used to sleep with an Eskimo dog, and got into the same kennel with it. It ate blubber and salt pork, but liked the sailors' pea soup better than anything else; it was most sociable, and could not bear to be alone—would tumble down the hatchway to seek the society of its beloved sailors, and scramble into the cabin if the door were open. When it fell ill and before it died, it seemed most grateful for any attention shown to it. The parent walrus shows the greatest courage in trying to defend the young one. Walruses are now scarce; but as the ivory is the only part of them of much present value, there is a chance that they may not be killed off entirely.

THE TRUE SEALS.

The TRUE SEALS, with their greatly modified forms, heads set almost on to their shoulders, with no neck visible, have well-developed claws on all the toes, and in the typical species have double-rooted and small cheek teeth. The number of the incisors is variable. The GRAY SEAL of the North Atlantic is a large species which visits the North British coasts and the Hebrides.

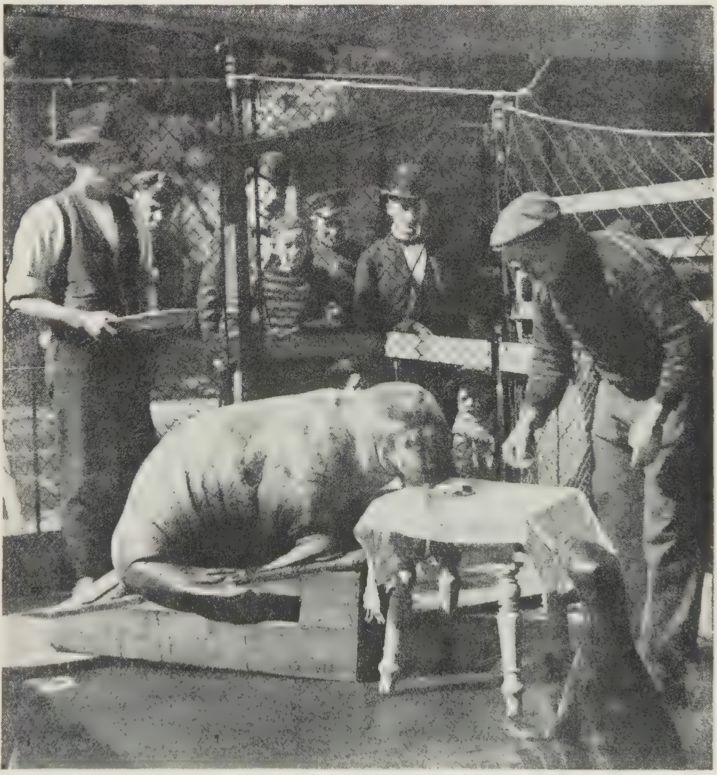
One old male shot off the coast of Connemara weighed nearly 400 lbs., and was 8 feet long. It is found off Scandinavia and eastwards to the coast of Greenland, and breeds off our coasts in October and November. This is the large seal occasionally shot up Scotch lochs. Its colour is yellowish gray, varied with blots and patches of dirty black and brown.

The Common Seal.

This seal is smaller than the preceding. It breeds on parts of the Welsh and Cornish coasts, and is found on both sides of the Atlantic and in the North Pacific. It assembles in small herds, and frequents lochs, estuaries, and river mouths. In the summer it is fond of following flounders and sea-trout up rivers. A few years ago one came up the Thames and was shot at Richmond. The young are born in June, and are grayish white. The adults are variously mottled with gray, brown, and black. The fondness of seals for music is proverbial. Macgillivray, the Scotch naturalist, said that in the Hebrides he could bring half a score of them within forty yards of him by a few notes on his flute, when they would swim about with their heads above water like so many black dogs. A seal was captured by the servants of a landowner near Clew Bay, on the west coast of Ireland, and kept tame for four years. It became so attached to the house that, after being carried out to sea three times, it returned on each occasion. The cruel wretches who owned it then blinded it, out of curiosity to see whether it could find its way back sightless. The poor animal did so after eight days.

The common seal is still fairly numerous on the rocky western coasts of the British Islands, though a few old seals, unable to forget their early habits, appear now and then in Morecambe Bay and in the Solway. It is not uncommon off the coasts of Caithness and Sutherland. It also frequents a sand-bank in the Dornoch Firth, though it has been much persecuted there. The common seal is gregarious, while the gray seal usually lives only in pairs, or at most in small companies. Two or three dozen like to lie closely packed on shore with all their heads turning seawards. The white hair of the young seals —which, as already said, are born in June—is shed in a day or two, when the young take to the water. With regard to their reputed musical proclivities, some experiments made at the Zoological Gardens did not bear out this belief; but there is much evidence that in a state of nature they will approach and listen to music. The common seal has a large brain capacity, and is a very intelligent creature. The upper parts of this seal are yellowish gray, spotted with black and brown, the under parts being silver-gray.

The Harp-seal is an Arctic or ice-seal which sometimes finds its way here. The young are born



By permission of Herr Carl Hagenbeck] [*Hamburg*

WALRUS AND SEA-LION

Another photograph of the walrus tamed by Herr Carl Hagenbeck. Notice the sea-lion in the right hand corner, which also formed one of the same performing troupe

Photo by York and Son] [*Notting Hill*

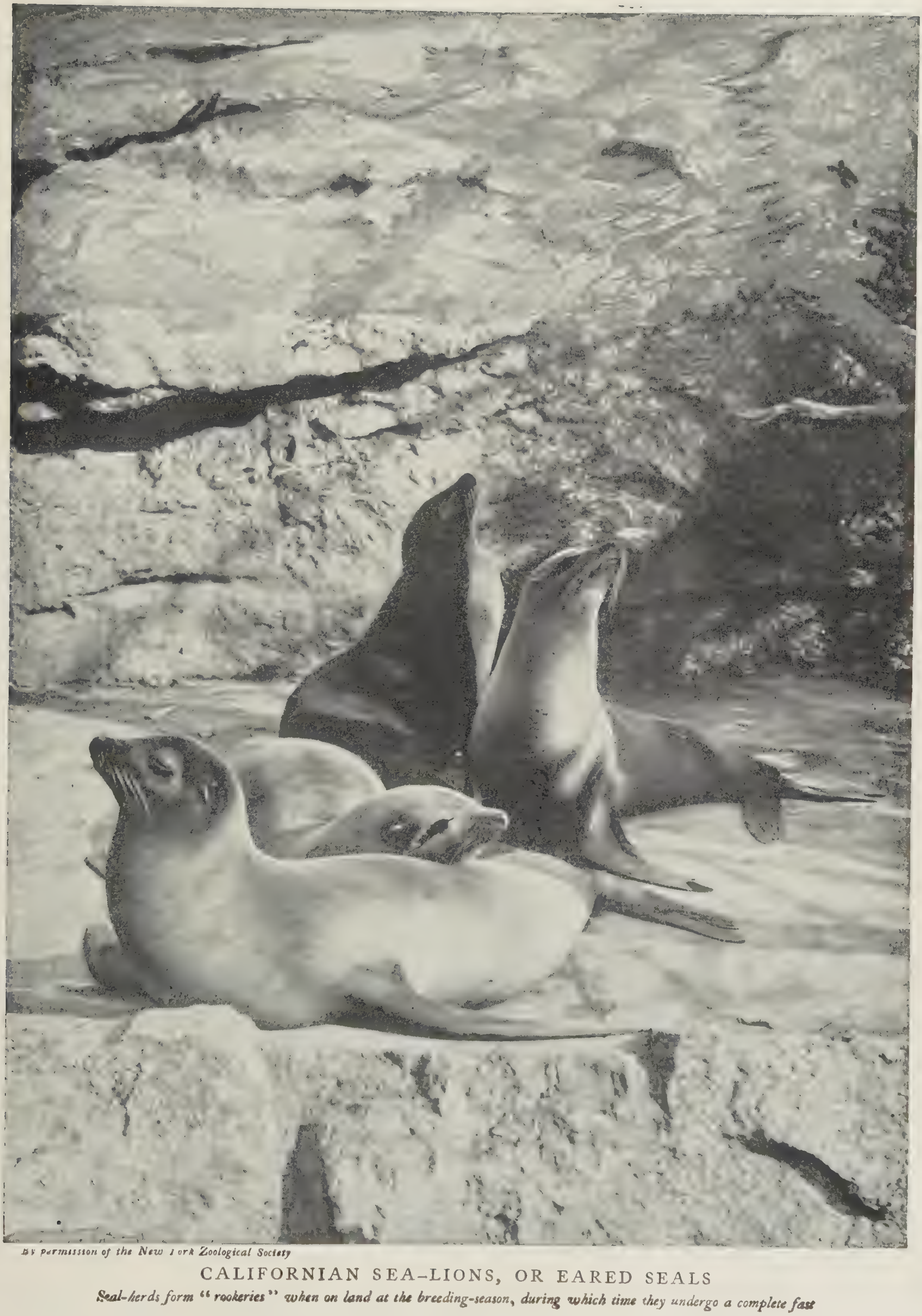
GRAY SEAL

Seals are not so well adapted as sea-lions for getting about on the dry land, and, except for their habit of coming ashore to bask in the sun, are thoroughly aquatic

on ice-floes. It is found in great herds in Davis Straits, on the coasts of Greenland and in the greater part of the frozen Arctic Ocean. It is the animal which the sealing-vessels which hunt seals for oil and "hair"—that is, the leather of the skins, not the fur—seek and destroy. In the old days they could be seen in tens of thousands blackening square miles of ice. They are still so numerous that in Danish Greenland more than 30,000 are taken each year. The RINGED SEAL is a small variety, not more than 3 or 4 feet in length, found in great numbers in the Far North. Its flesh is the main food of the Eskimo, and its skin the clothing of the Greenlanders. The seals make breathing-holes in the ice. There the Eskimo waits with uplifted spear for hours at a time, until the seal comes up to breathe, when it is harpooned. The BLADDER-NOSED SEAL is a large spotted variety, with a curious bladder-like crest on the head and nose of the male. Unlike all other seals, it sometimes resists the hunters and attacks the Eskimo in their kayaks.

If any evidence were needed of the great destruction which the sealing and whaling industry causes, and has caused, among the large marine animals, the case of the ELEPHANT-SEALS ought to carry conviction. These are very large seals, the male of which has a projecting nose like a proboscis. They were formerly found both north and south of the Equator, their main haunts being on the coast of California, and on the islands of the South Pacific and Antarctic Ocean. They are gigantic compared with the common seals, some of the males being from 16 to 20 feet long. Cuttle-fish and seaweed are the principal food of this seal, which was formerly seen in astonishing numbers. The whaling-ships which hunted both these seals and sperm-whales at the same time almost destroyed those which bred on the more accessible coasts, just as the earlier whalers entirely destroyed Steller's sea-cow, and their modern descendants destroyed the southern right-whales. The elephant-seal is now very scarce, and when one is killed the skin is regarded as something of a curiosity.

In the records of the voyage of the *Challenger* it is stated that there were still great numbers of the elephant-seals surviving near Heard Island, and not a few round the shores of Kerguelen Island. Professor Moseley states that on the windward shore of Heard Island "there is an extensive beach, called Long Beach. This was covered with thousands of sea-elephants in the breeding-season; but it is only accessible by land, and then only by crossing two glaciers. No boat can safely land on this shore; consequently men are stationed on the beach, and live there in huts. Their duty is constantly to drive the sea-elephants from this beach into the sea, which they do with whips made out of the hides of the seals themselves. The beasts thus ousted swim off, and often 'haul up,' as the term is, upon the accessible beach beyond. In very stormy weather, when they are driven into the sea, they are forced to betake themselves to the sheltered side of the island. Two or three old males, which are called 'beach-masters,' hold a beach for themselves and cover it with cows, but allow no other males to haul up. They fight furiously, and one man told me that he had seen an old male take a young one up in his teeth and throw him over, lifting him in the air. The males show fight when whipped, and are with



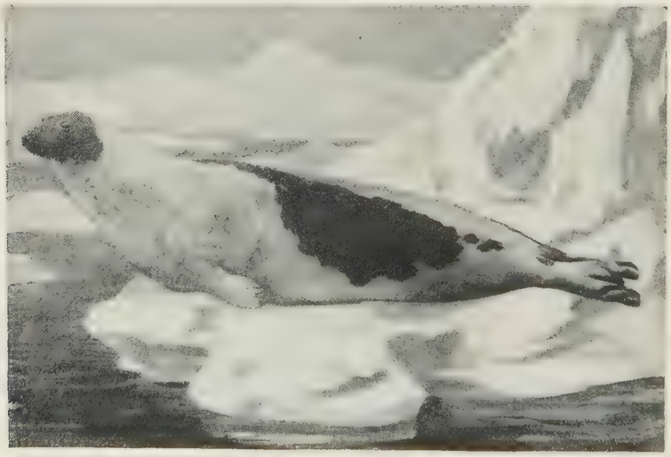
By permission of the New York Zoological Society

CALIFORNIAN SEA-LIONS, OR EARED SEALS

Seal-herds form "rookeries" when on land at the breeding-season, during which time they undergo a complete fast great difficulty driven into the sea. The females give birth to their young soon after their arrival. The new-born young ones are almost black, unlike the adults, which are of a light slate-brown. They are suckled by the female for some time, and then left to themselves, lying on the beach, where they seem to grow fat without further feeding. They are always allowed by the sealers to lie like this, 'in order to make more oil.' This account was corroborated by all the sealers I met, but I do not understand it. Probably the cows visit their offspring unobserved from time to time. Péron says that both parent elephant-seals stay with the young without taking any food at all till the latter are about six or seven weeks old, and that the old ones conduct the young to the water and carefully keep them company. The rapid increase in weight is in accordance with Péron's account. Goodridge gives a somewhat different story—namely, that after the females leave the young the old males and the pups proceed inland, as far as two miles sometimes, and stop without food for more than a month, during which time they lose fat. The male sea-elephants come ashore for the purpose of breeding about the middle of August, the females a little later."

Formerly the elephant-seals were found as far north as the Californian coast, where their capture was the main business of the sealing-traders. This species also formed the mainstay of the far southern sealers. As the elephant-seals were killed off, so the business became less and less profitable. It is to be hoped that the voyages of exploration to the Antarctic ice-fringe will not lead to the discovery of fresh sealing-grounds, for if this is the case there is little chance that any of the southern seals will escape entire destruction. Some form of close time has already been enforced in the pursuit of the hair-seals of Northern Europe; but it is very desirable that the species still found on our own coasts should also receive protection. Except when they paid visits to the fixed salmon-nets, they never did any harm; and fixed nets are now illegal. When a seal learned the use of the stake-nets, which these animals were very quick to understand, it would wait quietly till it saw a fish caught, and then swim up and carry it off before the fishermen could take it.

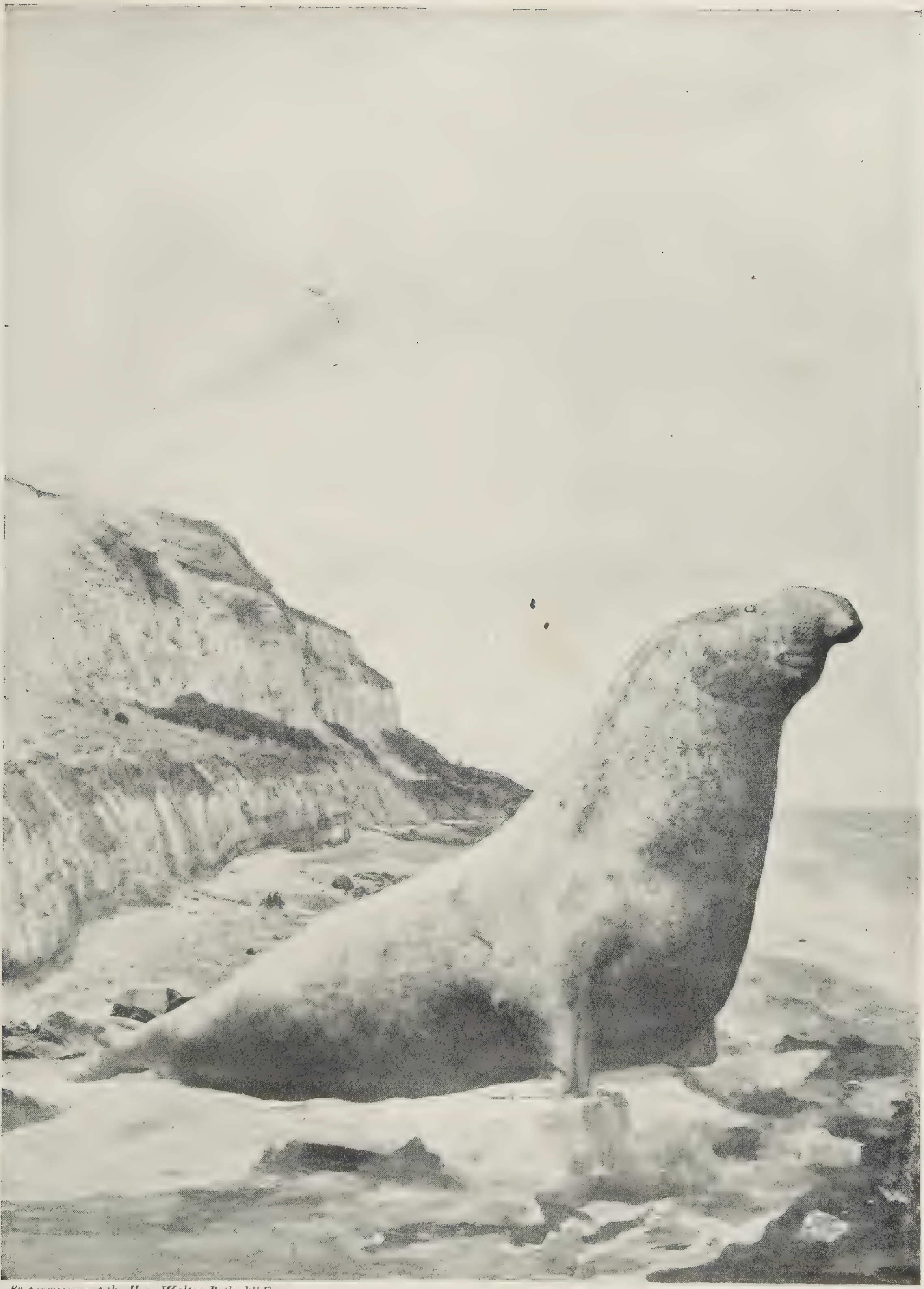
Two species—namely, the Common Seal and Gray Seal—still regularly visit our shores. The common seal breeds on our southwestern coasts, and the gray seal off the Hebrides. If the common seal were accorded a close time, its numbers would probably increase; and the spectacle of such interesting creatures visible on our coast could not fail to be of great interest. All the old legends of mermaids and wild men of the sea are based on the capture of seals. Perhaps the most ancient is one which records such a capture in the river near Orford Castle, in Suffolk, in the reign of Henry II. The ignorant soldiers were persuaded that it was a man, and tortured it to make it speak. They then took it to the church, and showed it the sacred emblems. As it "showed no reverence," they took it back to the castle, and fed it on fish. It was allowed to go into the river, but returned to its captors of its own accord. Later it swam away to the sea. The monk who recorded the story stated his conviction that this seal was an evil spirit which had got into the body of a drowned sailor. A gray seal was taken not many years ago in the creek leading up to the little town of Wells, in Norfolk. It was so tame that the fishermen caught it by throwing coats over it as it lay on the mud.



By permission of the Hon. Walter Rothschild] [Tring

HARP-SEAL

The harp-seal comes from Greenland



By permission of the Hon. Walter Rothschild] | *Tring*

SEA-ELEPHANT

These enormous seals (about 20 feet in length) are becoming very scarce. When they come ashore, they are easily approached, though not so easily killed. They are much valued for their oil. Note the trunk-like prolongation of the nose, which, when the animal is excited, becomes distended

CHAPTER IX.

THE RODENTS, OR GNAWING ANIMALS.

THE Rodents, or Gnawing Mammals, have all the same general type of teeth, from which the order receives its distinctive name. There are a very large number of families and of genera among the rodents, more than in any other order of mammals. All the rodents possess a pair of long chisel-shaped incisor teeth in each jaw. The ends of these teeth are worn into a sharp edge which cuts like a steel tool. In most rodents these are the only teeth in that part of the jaw, a wide gap intervening between them and the other teeth. The hares, rabbits, and calling-hares have a minute pair of teeth set just behind the large pair in the upper jaw. The grinding-teeth are set far back, and are never more than six in number, these being sometimes reduced to four. Rodents generally have five toes on the fore feet; in the hind feet there are in some cases only four, or even three. None of the species are of great size; the largest, the CAPYBARA, a water-living animal of South America, is about the dimensions of a small pig. But the number of species of small rodents is prodigious, and their fecundity so great that they constantly increase in favourable seasons until they become a plague. Voles, lemmings, field-mice, and rabbits are constant sources of loss to agriculture in their seasons of extraordinary increase. Most rodents feed on vegetables, though rats and mice have developed carnivorous tastes. No rodents have canine teeth.

Photo by W. P. Dando]

CAPYBARA

This, the largest of the rodents, is found by the rivers of South America

By permission of Professor Bumpus, New York

FLYING-SQUIRREL

One of the small species of the group

THE SQUIRRELS.

Those of the order of Gnawing Animals which have only two incisors in each jaw, and no rudimentary teeth like those possessed by the hares, are called "Simple-toothed Rodents." Of these the family usually placed first in order is that of the SQUIRRELS and their allies. The True Squirrels and Marmots have five molar teeth on each side of the upper jaw.

Squirrels are found in nearly every temperate part of the globe, from Norway to Japan, and in very great numbers in India and the tropics. Everywhere they are favourites;

and though they do some mischief in highly cultivated countries, they are among the most harmless of creatures. Most of them live on wild nuts and the kernels of fruit; they suck eggs occasionally, and in Canada will come to the traps in extreme cold and eat the meat with which they are baited.

The Red Squirrel.

This, the common squirrel here, is representative of the whole order. In old Scandinavian legends the squirrel is represented as the messenger of the gods, who carried the news of what was going on in the world to the other animals. Together with its close relations, it is the most graceful of all climbers of trees. With its long tail waving behind it, it races up or down the trunks and across the forests from branch to branch as easily as a horse gallops across a plain. It will descend the trunk head downwards as fast as it runs up. Squirrels pair for life, and are most affectionate little creatures, always playing or doing gymnastics together. The squirrel builds a very good house, in which he shows himself far more sensible than the monkeys and apes; it is made of leaves, moss, and sticks. The sticks come first as a platform; then this is carpeted, and a roof put on. No one who has seen common squirrels at work house-building has ever described exactly how they do it; it is the best nest made by any mammal, thoroughly well fitted together and waterproof. In this nest the young squirrels are born in the month of June; that year they keep with the parents, and do not "set up for themselves" till the next spring. The red colour is very persistent in squirrels. One Chinese variety, black and red, has even bright red teeth. In cold countries the red squirrels make stores of food, but spend much of the winter asleep.

[illegible] J. S. Rudland & Sons

FLYING-SQUIRREL

The large flying-squirrels are mainly nocturnal. They can leap a distance of 40 feet with the aid of the parachutes of skin stretching from the fore to the hind limbs

It is a great pity that in England no ones tries to tame the squirrels as they do in America; there they are the greatest ornament of the parks of cities, coming down to be fed as tamely as our sparrows. The writer has known one instance in which a lady induced wild squirrels to pay daily visits to her bedroom for food; they used to climb up the ivy and jump in at the open window. The great enemies of squirrels near houses are the cats, which kill all the young ones when they first come down from the trees. In a garden in the country a pair of squirrels had a family every summer for five years, but none ever survived the cats' persistent attacks. These squirrels were most amusing and improvident. They used to hide horse-chestnuts, small potatoes, kernels of stone fruit, bulbs of crocuses, and other treasures in all kinds of places, and then forget them. After deep snows they might be seen scampering about looking into every hole and crevice to see whether that happened to be the place where they had hidden something useful. Much of the store was buried among the roots of trees and bushes, and quite hidden when the snow fell.

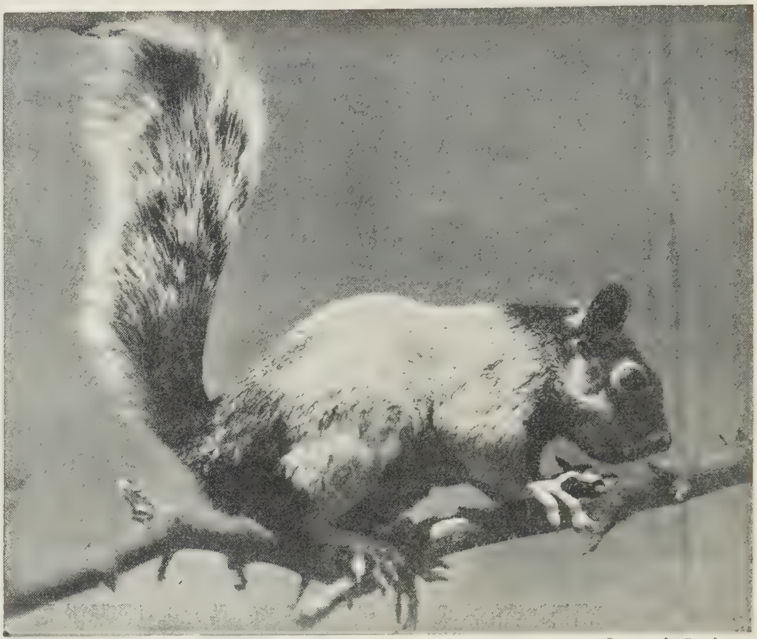


Photo by W. P. Dando] [*Regent's Park*

DORSAL SQUIRREL FROM CENTRAL AMERICA

A most beautiful species The main colour is red, but the back is French gray, and the tail French gray and red mingled.

THE FLYING-SQUIRRELS.

One of the finest squirrels is the TAGUAN, a large squirrel of India, Ceylon, and the Malacca forests. It is a "flying-squirrel," with a body 2 feet long, and a bushy tail of the same length. Being nocturnal, it is not often seen; but when it leaps it unfolds a flap of skin on either side, which is stretched (like a sail) when the fore and hind limbs are extended in the act of leaping; it then forms a parachute. The colour of this squirrel is gray, brown, and pale chestnut. There are a number of different flying-squirrels in China, Formosa, and Japan, and in the forests of Central America. One small flying-squirrel, the POLATOUCHE is found in Northeast Russia and Siberia. It flies from tree to tree with immense bounds, assisted by the "floats" on its sides. Though only six inches long, it can cover distances of 30 feet and more without difficulty. Wherever there are birch forests this little squirrel is found.

In Africa, south of the Sahara, the place of the Oriental flying-squirrel is taken by a separate family. They have a different arrangement of the parachute from that of the flying-squirrels of India. This wide fold of skin is supported in the Asiatic squirrels by a cartilage extending from the wrist. In the South African flying-squirrels this support springs from the elbow, not from the wrist; they have also horny plates on the under-surface of the tail. Many of the tropical flying-squirrels

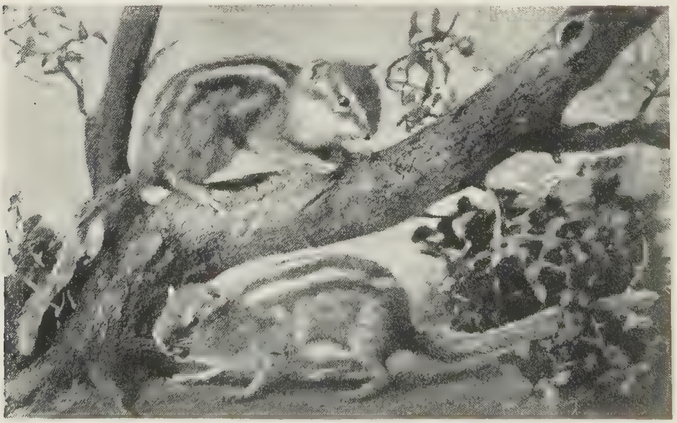


Photo by A. S. Rudland & Sons

ASIATIC CHIPMUNKS

Small ground-squirrels which store food for the winter

Photo by Scholastic Photo. Co.] [Parson's Green

LONG-TAILED MARMOT

The marmots live by preference on high and cold mountains just below the line of eternal snow in Europe. In Asia, where the snow-line is higher, they are found at altitudes of 12,000 feet

are quite large animals, some being as large as a small cat.

Mr. W. H. Adams says of Pel's Flying-squirrel, a West African species: "These squirrels come out of their holes in the trees some hours after sunset, and return long before daybreak. They are only visible on bright moonlight nights. The natives say that they do not come out of their holes at all in stormy weather, or on very dark nights; they live on berries and fruits, being especially fond of the palm-oil nut, which they take to their nests to peel and eat. They pass from tree to tree with great rapidity, usually choosing to jump from a higher branch to a lower one, and then climbing up again to make a fresh start. . . . They litter about twice in a year, once in September. The young remain in the nest for about nine weeks, during which they are fed by the old ones on such food as shoots and kernels. They do not attempt to jump or 'fly' till the end of that period, extending the length of their jumps with their growth."

The Ethiopian Spiny Squirrels have coarse spiny fur; the little Indian Palm-squirrel is marked with longitudinal dark and light stripes on the back; others have light bands on their flanks.

The Alpine Marmot is a much larger species than the prairie-dog. It lives on the Alps just below the line of perpetual snow. From five to fifteen marmots combine in colonies, dig very deep holes, and, like the prairie-dogs, carefully line them with grass; they also store up dry grass for food. In autumn they grow very fat, and are then dug out of the burrows by the mountaineers for food. Young marmots used to be tamed and carried about by the Savoyard boys, but this practice is now rare. The monkey is probably more attractive to the public than the fat and sleepy marmot. Marmots are about the size of a rabbit, and have close iron-gray fur.

Tschudi, the naturalist of the Alps, says of the marmots that they are the only mammal which inhabits the region of the snows. No other warm-blooded quadrupeds live at such an altitude. In spring, when the lower snows melt, there are generally small pieces of short turf near their holes, as well as great rocks, precipices, and stones. Here they make their burrows, outside which they feed, with a sentinel always posted to warn them of the approach of the eagle or lammergeir. The young marmots, from four to six in number, are born in June. When they first appear at the mouth of the holes, they are bluish gray; later the fur gains a brownish tint. The burrows are usually at a height of not less than 7,000 or 8,000 feet. Winter comes on apace. By the end of autumn the ground is already covered with snow, and the marmots retire to sleep through the long winter. As they do not become torpid for some time, they require food when there is none accessible; this they store up in the form of dried grass, which they cut in August, and leave outside their burrows for a time to be turned into hay.

The Alpine Marmot is also found in the Carpathians and the Pyrenees. Another species, the Bobac, ranges eastward from the German frontier across Poland, Russia, and the steppes of Asia to Kamchatka. In Ladak and Western Tibet a short-tailed species, the Himalayan Marmot, is found, sometimes living at a height of nearly 17,000 feet. The Golden Marmot is found in the Pamirs.

THE DORMICE.

There are a considerable number of animals, even here, which hibernate. Most of these feed largely on insect food, which in winter is unobtainable in any great quantity. Consequently the hedgehog and the badger, which live largely on snails and worms, go to sleep in the famine months. So does the sleepiest of all—the DORMOUSE. This alone would show that this little rodent probably feeds on insects very largely, for if it only ate nuts and berries it could easily store these, and find a good supply also in the winter woods. It has been recently proved that dormice are insectivorous, and will eat aphides, weevils, and caterpillars. But a dormouse hibernates for so long a time that one might imagine its vitality entirely lost; it sleeps for six months at a time, and becomes almost as cold as a dead animal, and breathes very slowly and almost imperceptibly. Mr. Trevor-Battye says that if warmed and made to awaken suddenly in the winter it would die in a minute or two, its heart beating very fast, "like a clock running down." Before their hibernation dormice grow very fat. There is a large species, found in Southern Europe, which the Romans used to eat when in this fat stage. In winter dormice usually seek the nest of some small bird, and use it as a sleeping-place. They pull out and renew the lining, or add a roof themselves. Into the interior they carry a fresh supply of moss, and sleep there in great comfort. Their great enemy at this time is the weasel. There are two main groups of the dormice, divided by naturalists in reference to the structure of their stomach. The South African GRAPHIURES have short tufted tails. The hibernating habit is confined to the more northern species.

Photo by A. S. Rudland & Sons

POCKET-GOPHER

The pocket-gophers are almost entirely subterranean. Their burrowing powers are remarkable. The teeth as well as claws are used to aid them

THE MOUSE TRIBE.

This family, which includes the MICE, RATS, and VOLES, contains more than a third of the number of the whole order of Rodents. Some are arboreal, others aquatic; but most are ground-living animals and burrowers. The number of known species has been estimated at 330. Among the most marked types are the WATER-MICE of Australia and New Guinea, and of the island of Luzon in the Philippines. The feet of the Australian species are webbed, though those of the Philippine form are not. The GERBILS form another group, mainly inhabitants of desert districts. They have very large eyes, soft fur, and tails of various length and form in different species. They have greatly developed hind legs, and leap like jerboas, and are found in Southern Europe, Asia, and Africa. The PHILIPPINE RATS, large and long-haired, and the TREE-MICE of Africa south of the Sahara, form other groups. A very mischievous race of rodents is represented in Europe by the HAMSTERS, and in America by a closely allied group, the WHITE-FOOTED MICE.

THE HAMSTERS.

The HAMSTER is a well-known European species, and represents the group of pouched rats.

Photo by A. S. Rudland & Sons

LONG-EARED JERBOA

These curious little animals are mainly desert creatures. They move by a series of leaps

These creatures have cheek-pouches to aid them in carrying food. In addition they are most voracious and inquisitive, so that the hamster is a type throughout Central Europe of selfishness and greed. We are sorry to add that John Bull occasionally appears in German cartoons as the " Land-hamster," or land-grabber. Hamsters are numerous from the Elbe to the Obi. They burrow and make cellars in the corn- and bean-fields, and convey thither as much as a bushel of grain. As soon as the young hamsters can shift for themselves, each moves off, makes a separate burrow, and begins to hoard beans and corn. As the litter sometimes contains eighteen young, the mischief done by the hamster is great. Its coloration is peculiar. The fur, which is so thick as to be used for the linings of coats, is a light yellowish brown above. A yellow spot marks each cheek. The lower surface of the body, the legs, and a band on the forehead are black, and the feet white. Thus the hamster reverses the usual natural order of colour in mammals, which tends to be dark on the back and light below. The animal is 10 inches long, and very courageous. Hamsters have been known to seize a horse by the nose which stepped on their burrow, and at all times they are ready to defend their home. Besides vegetables and corn, they destroy smaller animals. They spend the winter in a more or less torpid state in their burrows, but emerge early in spring. They then make their summer burrows and produce their young, which in a fortnight after birth are able to begin to make a burrow for themselves.

Among the South American members of the group to which the hamster belongs are the FISH-EATING RATS, with webbed hind feet. The RICE-RAT, which is found from the United States to Ecuador, lives on the Texas prairies much as do the prairie-marmots, though its burrows are not so extensive, and often quite shallow. In these the rats make beds of dry grass.

THE VOLES.

The VOLES are allied to the preceding groups, but are marked externally by a shorter and heavier form than the typical rats and mice. Their ears are shorter, their noses blunter, their eyes smaller, and the tail generally shorter. They are found in great numbers at certain seasons, when

Photo by A. S. Rudland & Sons

CAPE JUMPING-HARE

This animal is very common in South Africa. The Boers call it the " Springhaas "

Photo by A. S. Rudland & Sons

OCTODONT

The octodont, so called because they have four molar teeth on each side of the jaw are a group of rodents found mainly in South America

they often develop into a pest. The SHORT-TAILED FIELD-VOLE is responsible for much destruction of crops in Europe. One of the latest plagues of these animals took place in the Lowlands of Scotland, where these voles devoured all the higher pastures on the hills. Nearly at the same time a similar plague occurred in Turkish Epirus. When a special commissioner was sent to enquire into the remedies (if any existed) there in use, he found that the Turks were importing holy water from Mecca to sprinkle on the fields affected. The BANK-VOLE is a small English species, replaced on the Continent by the SOUTHERN FIELD-VOLE.

The WATER-RAT belongs to the vole group. It is one of the most commonly seen of all American mammals—probably, except the rabbit, the most familiar. Although not entirely nocturnal, it prefers the darkness or twilight; but whenever the visitor to the waterside keeps still, the water-rats will allow him to watch them. The writer has had rather an extensive acquaintance with these cousins of the beavers, and, while watching them, has never ceased to be struck with their close resemblance to those creatures. At Holkham Lake, in Norfolk, he noticed a willow-bush, in which a number of twigs had been gnawed off; and then saw the missing sticks lying neatly peeled, just like "beaver-wood," in the water below. Waiting quietly, he noticed a water-rat climb into the bush, gnaw off a willow twig, descend with it to the edge of the water, and there, sitting on some crossed boughs, peel and eat the bark, just as a beaver does. By rivers a sound is often heard in the round reeds as of something tearing or biting them; it is made by the water-rats getting their supper. The rat cuts off three or four sedges and makes a rough platform. It then cuts down a piece of one of the large round reeds full of pith, and, holding it in its hands, seizes the bark with its teeth, and shreds it up the stem, peeling it from end to end. This exposes the white pith, which the rat then eats. Water-rats have been seen to swim out and pick up acacia blossoms floating on the water. When swimming under water, each hair is tipped by a little bubble, which makes the rat look like quicksilver. When it comes out, the rat shakes itself with a kind of shiver, throwing all the water off its coat. Though so good a swimmer, its feet are not webbed. It is found from Scotland to the Bering Sea, but not in Ireland.

In the Far North the LEMMING takes the place of the voles. It is a very small, short-tailed creature, like a diminutive prairie-dog. Like the voles, lemmings have seasons of immoderate increase. They then migrate in enormous flocks, and are said never to stop till they reach the sea, into which they plunge. It is believed that they are following an inherited instinct, and that where there is now sea there once was land, over which they passed onwards.

The MUSK-RAT inhabits the same waters as the beaver of North America. It makes a house, generally

Photo by L. Medland, F.Z.S.] [North Finchley

COYPU

This is a large aquatic rodent, found on the South American rivers. Its fur, called "nutria," forms a valuable export from Argentina of reeds piled in a mound, in the lakes and swamps. The body is only 12 inches long, but the fur is thick and close, and much used for lining coats and cloaks. The vast chains of rivers and lakes in Canada make that country the favourite home of the musk-rat. This creature lives upon roots of aquatic plants, fresh-water-mussels, and stems of juicy herbs. Besides making the domed houses of grass, reeds, and mud, it also burrows in the banks of streams. There it makes rather an elaborate home, with numerous passages leading to the water. The odour of musk is very strong even in the skin. The tail is narrow and almost naked. This species is the largest of the vole group.

Photo by A. S. Rudland & Son

SHORT-TAILED HUTIA

The hutias are another group of octodonts, found in the West India Islands

THE TYPICAL RATS AND MICE.

These animals were originally an Old World group. Though the brown rat is now common in America, it is believed to have come originally from China.

A very large number of animals are now almost dependent on man and his belongings. Such creatures are said to be "commensalistic," or eaters at the same table. They are often very unwelcome guests, whether they are flies, sparrows, or cockroaches; but probably the least welcome of all are the rats and mice. The BROWN RAT is the best known of any. It has come into worse repute than usual of late, because it is now certain that it harbours the plague-bacillus, and communicates the disease to man. Its habits and appearance need no description. The BLACK RAT is the older and smaller species indigenous in Europe, which the brown rat has almost extirpated from England. A few old houses still hold the black rat, and there are always a few wild ones at the Zoological Gardens which feed in the animals' houses. The BLACK-AND-WHITE RAT (not the albino white rat) kept tame in this country is probably a domesticated form of the ALEXANDRINE RAT of Egypt.

The HOUSE-MOUSE is now found in all parts of the world to which Europeans have access. In England its main home is in the corn-ricks. Were the farmers to thresh the grain, as is done in the United States, as soon as it is cut, mice would be far less common. Besides these parasitic mice, there are a host of field- and forest-mice in this and other countries. One of the best-known English species is the HARVEST-MOUSE, which makes a globular nest of grass in the wheat-fields, attached to stems of corn or weeds. In this the young are born. In winter the mouse lives in holes in banks, and lays up a store of kernels and grain. The WOOD-MOUSE is larger than the former, or than the HOUSE-MOUSE. It is yellowish brown in colour, lays up a great store of winter food, and is itself the favourite prey of the weasel.

By permission of the Hon. Walter Rothschild, Tring

PORCUPINE

The common porcupine is found in North America, Italy, Spain, and North Africa

The Bandicoot.

A very mischievous class of rats is represented by the various species of Bandicoot. They are found throughout Southern Asia as far as Ceylon, and in Kashmir and Turkestan. The Bandicoot-rat of India is a large and destructive species which is sometimes brought to the London docks in ships, but has not spread into the country.

Photo by A. S. Rudland & Sons

PORCUPINE

This photograph shows the arrangement of the porcupine's defense of spines; but when frightened it erects these, so as to form a complete protection to the body

Other Murine Rodents.

Among the numerous other rodents allied to the rat group are the Mole-rats, with short mole-like bodies. The largest is the Great Mole-rat, found in Southeastern Europe, Southwestern Asia, and Northeastern Africa. It is a subterranean creature, burrowing for food like a mole. The Bamboo-rats have minute eyes, small external ears, and a short tail partly covered with hair. In Somaliland a small, almost naked Sand-rat is found, which burrows in the sand of the desert, throwing up little heaps like mole-hills.

The Gophers.

In North and Central America the Pocket-gophers form a curious group of small rodents with cheek-pouches opening on the outside. They spend their entire existence underground, and are said to use their incisor teeth as picks to open the hard earth in their tunnels. They push the loosened soil out by pressing it with their chests and fore feet. When a gopher has eaten enough to satisfy the immediate calls of hunger, it stores all spare food away in the large cheek-pouches. When gophers desire to empty the pouches, they pass their feet along their cheeks from behind, and press the food forwards on to the ground.

The Jerboas, Springhaas, and Jumping-mice.

The hopping rodents have an immense range, from Southern Europe, through Africa, Arabia, India, and Ceylon, and even in the New World, where the American Jumping-mouse is found throughout the northern part of the continent. The latter is only 3 inches long. The true Jerboas are mainly found in Africa. All these, when excited, move like kangaroos. Their main home is the Central Asian steppe region, but they are found in Egypt, India, Syria, and Arabia. The hind legs are much elongated, the fore legs very small, and the body usually of a sandy colour. The American jumping-mouse, though a very small creature, can cover from 3 to 5 feet at each leap. It inhabits the beech and hard-wood forests. In winter it makes a globular nest about 6 inches under the surface of the ground.

The Cape Jumping-hare forms a family by itself, with no near allies. It is of a tawny brown

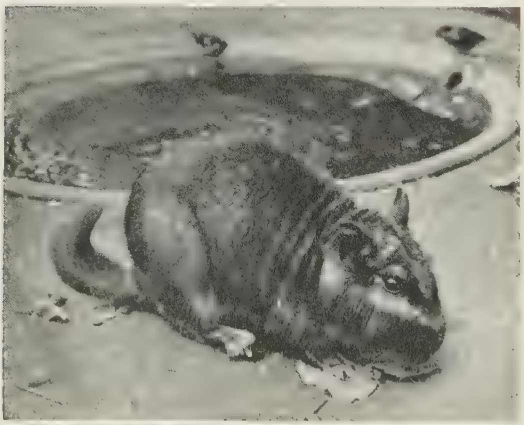


Photo by W. P. Dando] [Regent's Park

VISCACHA

The Viscacha forms colonies like those of the prairie-dogs. It is found on the pampas south of the La Plata

Photo by W. P. Dando

CHINCHILLA

A small rodent of the Andes, possessing very soft and valuable gray fur

colour, becoming almost pure white below. The tail is long, and carried upright as the animal leaps. The head and body are nearly 2 feet long, and the tail 20 inches. It is found both in the plains and mountains of South Africa, where it makes deep burrows, in which several families live. It is mainly nocturnal.

The Octodont Family.

America is the main home of this family of rodents, though there are several representatives in Africa. Their name is due to the fact that they have four molar teeth on each side of the jaw. The best-known species is the Coypu, or Nutria, of South America, an aquatic, fur-bearing animal. It is very plentiful in the large rivers of that continent, where its fur is a valuable commodity for export. When swimming, the female coypu carries its young on its back. The coypu is usually 20 inches long, with a tail two-thirds of the length of its head and body. The general colour is brown above and brownish yellow below. Coypus live in pairs in holes in the river-banks. In the Chonos Archipelago they frequent the seashore, and burrow near the beach.

The Hutia, another large octodont, is found in the West Indies. There are two species, both partly arboreal. The Tuco-tucos, burrowing octodonts of the pampas and the far south of the American Continent, are rat-like animals, with large claws and very small eyes and ears.

The Porcupines.

These animals are either tree-climbers or ground-dwellers. The former are found in South America, though one, the Canadian Porcupine, is found in the North; the latter are European and Asiatic. In Africa they are also common. The Canadian porcupine passes nearly all its life in trees, feeding on the leaves; but it has not a prehensile tail. The Common Porcupine is abundant in Italy (where it is eaten by man), Greece, Spain, and Africa. It lives in burrows or among rocks. In India a very similar species is found. The head and shoulders of these ground-porcupines are not protected by the larger sharp spines which guard the rest of their bodies.

The tree-porcupines of the forests of Central America have long prehensile tails, and are very lightly built. The quills are short, the head rounded, and the appearance very different from that of the European or African species. The common porcupine of Europe and North Africa measures about 28 inches in length from the nose to the root of the tail. The head, neck, and shoulders are covered with short spines and hairs, and the

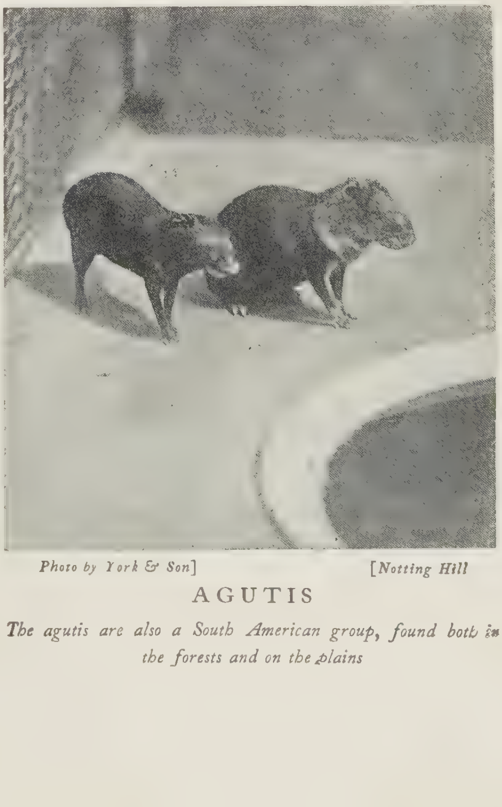


Photo by York & Son] [Notting Hill

AGUTIS

The agutis are also a South American group, found both in the forests and on the plains

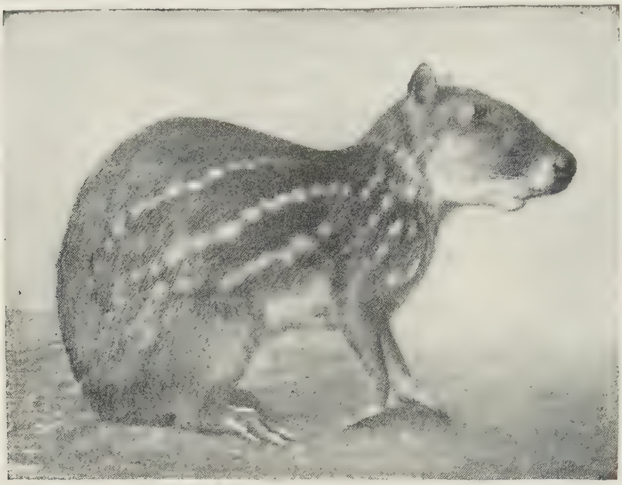


Photo by A. S. Rudland & Sons

PACA, OR SPOTTED CAVY

The pacas are among the larger rodents, found mainly in the northern part of the South American region

shoulders and back by a crest of long spines, varying from 12 to 15 inches in length. The tail also carries spines

VISCACHAS AND CHINCHILLAS.

On the plains of La Plata the commonest large rodent is the VISCACHA. It assembles in societies like the prairie-dogs, but is a much larger animal, from 18 inches to 2 feet long. Viscachas always set a sentinel to give warning of danger. They cut every kind of vegetable near and drag them to their holes; they also have a habit of picking up and collecting round the burrows any object which strikes them as curious. Articles lost by travelers, even whips or boots, may generally be found there. The viscacha belongs to the chinchilla family, but differs much from the beautiful creature of the high Andes from which chinchilla fur is taken. The COMMON CHINCHILLA is about 10 inches long, and the SHORT-TAILED CHINCHILLA rather smaller. The exquisite fur is well known. Two other chinchillas are more like hares in appearance. All four creatures are found on the Andes.

THE AGUTIS AND PACAS.

South America also produces a family of rodents not unlike small pigs, but nearer to the mouse-deer in general appearance; they are called AGUTIS. Mainly forest animals, but living also in the plains, they feed on grass, leaves, and plants of all kinds; they are very swift in their movements, and have much the habits of the small South African bucks. The fur is long, olive- or chestnut-coloured, and thick.

The PACAS are allied to the agutis, but are stouter; they live either in burrows made by themselves, or in holes in the banks of rivers, or in old tree-roots. The pacas are spotted and rather ornamentally marked; they are found from Ecuador to Brazil and Paraguay.

THE CAVIES.

The DINOMYS, a spotted rodent known by one example from Peru, has been thought to form a link between the pacas and the cavies, of which the guinea-pig is the most familiar and the aquatic capybara the largest. The original of our guinea-pig is believed to be the RESTLESS CAVY, a small rodent common on the plains of La Plata. It is dark blackish, with yellowish-gray and white hairs of the domesticated species; and it is suggested that the original of the present name was "Guiana pig." This cavy lives in thickets rather than in forests or plains.

The PATAGONIAN CAVY is a larger form, about twice the size of our hare. It burrows in the ground, and has a gray coat, with yellowish markings on the sides. It has been acclimatised successfully in France

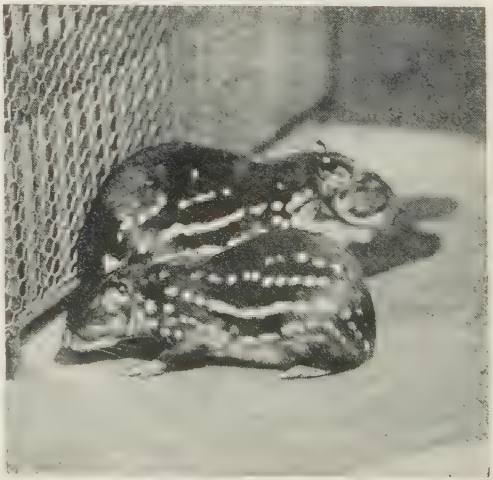


Photo by York & Son] [Notting Hill

PACAS, OR SPOTTED CAVIES

This photograph, which represents young animals, shows great perfection the linear arrangement of the stripes

Photo by Scholastic Photo. Co.

PATAGONIAN CAVY

This large species of cavy has been acclimatised successfully both in England and in France

and England. The flesh is like that of the rabbit.

The Capybara is the largest of all rodents. This species is, in fact, a gigantic water guinea-pig. It is found in all the great rivers of South America, from the Orinoco to the La Plata. It swims as well as a water-rat, though it is as large as a small pig. It feeds on weeds, water-plants, and grass. A capital photograph of this animal appears on page 146.

Pikas, Hares, and Rabbits.

The last two families of the Rodents have a small pair of rudimentary incisor teeth behind the large ones in the upper jaw. The Pikas, or Calling-hares, resemble the marmot tribe in general appearance. Their heads are short, their ears rounded, and, being tailless, they still less resemble the common hare; but their dentition marks them as allied. One species, about 9 inches long, is found in Siberia; and another, only 7 inches long, in the Rocky Mountains. The former has a habit of cutting grass and storing it in small stacks outside its hole for winter use; the Rocky Mountain species carries its hay into its burrows.

The Hares are a widely distributed group. They are found from the north of Scotland (where the gray mountain species turns white in winter) to the south of India, in South Africa, and across the continent of Asia to Japan. The Mountain-hare takes the place of the brown species in Scandinavia, Northern Russia, and Ireland; it is rather smaller, and has shorter ears and hind legs.

As early as 54 B.C., Cæsar, in his account of Britain, writes that the Common Hare was kept by the ancient Britons as a pet, but not eaten by them. It was protected by the Normans in the second list, or schedule, of animals reserved for sport. The first list included the *Beasts of the Forest*, the second the *Beasts of the Chase*, of which the hare was one of the first. The word "chase" has here a technical meaning, by which was understood an open park, or preserved area, midway in dignity between a forest and an enclosed park. "Hare parks" were also made, perhaps the most recent being that made at Bushey for the amusement of the sovereign

By permission of Professor Bumpus] [New York

WOOD-HARE

This is one of the forms intermediate between the hares and rabbits when at Hampton Court Palace. The name is often found surviving elsewhere. Near one of the large country English seats a walled park of 1,500 acres holds almost all the hares on the estate. If these parks and forest laws had not existed at an early date, it is probable that the hare would have become very scarce in this country.

Hares produce their leverets about the middle of April, though in mild seasons they are born much earlier. The number of the litter is from two to five. They are placed in a small hollow scraped out by the doe hare, but not in a burrow of any kind.

The instinct of concealment by remaining still is very highly developed in the hares and rabbits. They will often "squat" on the ground until picked up rather than take to flight. This seems almost a perverted instinct; yet hares often exhibit considerable courage and resource when escaping from their enemies. The following is an instance:—A hare was coursed by two young greyhounds on some marshes intersected by wide ditches of water. It first ran to the side of one of these ditches, and doubled at right angles on the brink. This caused the outer dog to lose its balance and to fall heavily into the deep and cold water. The hare then made straight for the line of walkers, and passed through them, with the other greyhound close behind it. The dog reached out and seized the hare by the fur of the back, throwing it down. The hare escaped, leaving a large patch of fur in the dog's jaws, doubled twice, and was again seized by the second dog, which had come up. It escaped from the jaws of the second pursuer, leapt two ditches 12 feet wide, and then sat for a moment behind a gate on a small bridge. This use of the only cover near caused the dogs to lose sight of it; they refused to jump the second drain, and the hare escaped.

Photo by C. Reid

WILD RABBITS

The Rabbit is too well known to need description either of its habits or appearance. It originally came from the countries south of the Mediterranean, but is now common in Northern Europe, and has become a pest in Australia and New Zealand. The rabbit breeds when six months old, and has several litters in each year.

CHAPTER X.

THE BATS AND INSECT-EATING MAMMALS.

BY W. P. PYCRAFT, A.L.S., F.Z.S.

THESE two groups are really closely allied; but the bats are generally considered apart, on account of their totally different mode of life. Originally, like their more commonplace relatives, they were dwellers upon the earth, or, more correctly, among the trees. By gradual modification of the fore limbs, and a corresponding development of folds of skin attached thereto, and to the body, they have acquired the power of flight. The cobego, to be mentioned presently, gives us a hint of how this may have come about.

The bats are the only members of the Mammalia which possess the power of true flight. The so-called flying-squirrels do not rightly deserve this title, for they have no wings. The wings of the bat have been formed by modification of the fore limbs, the finger-bones having become excessively lengthened, so as to serve as a support to a thin web of skin extending outwards from the body, much as the ribs of an umbrella support the covering. The hand of the bat is therefore a quite unique organ.

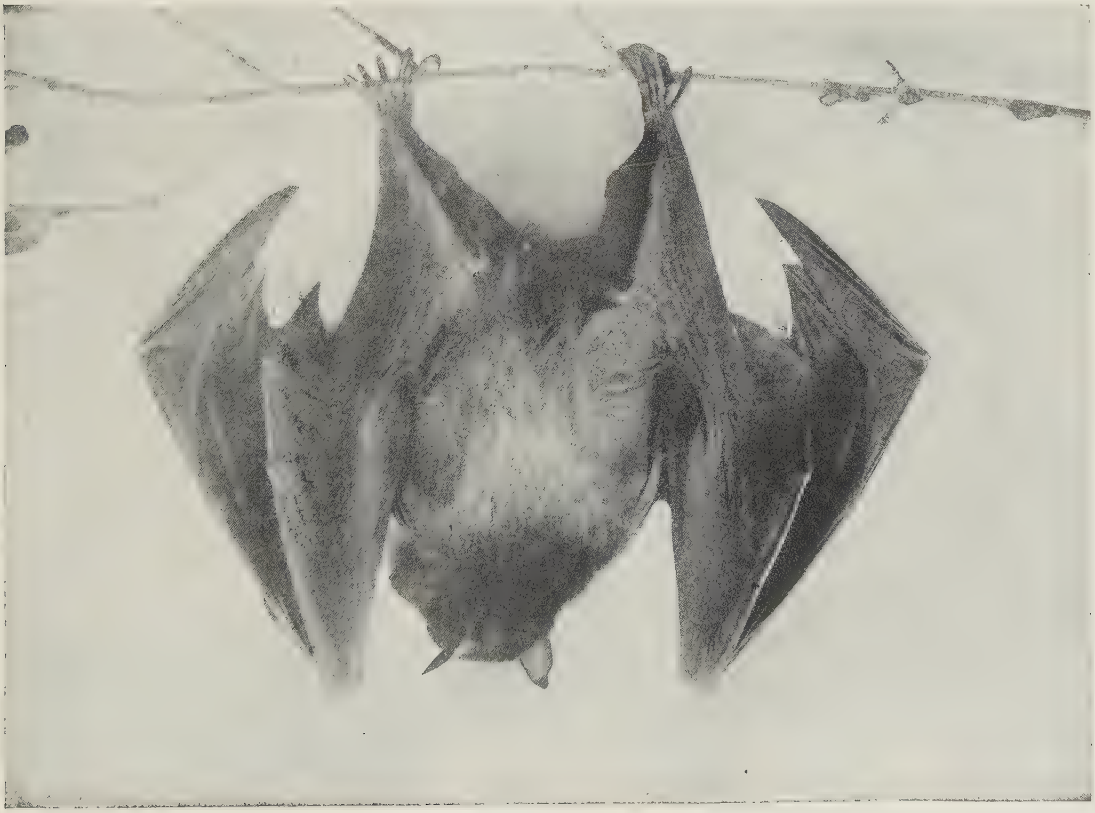


Photo by W. Saville-Kent, F.Z.S.] [*Croydon*

AUSTRALIAN FRUIT-BAT, OR "FLYING-FOX"

This photograph shows the "flying-fox" in its customary resting position.

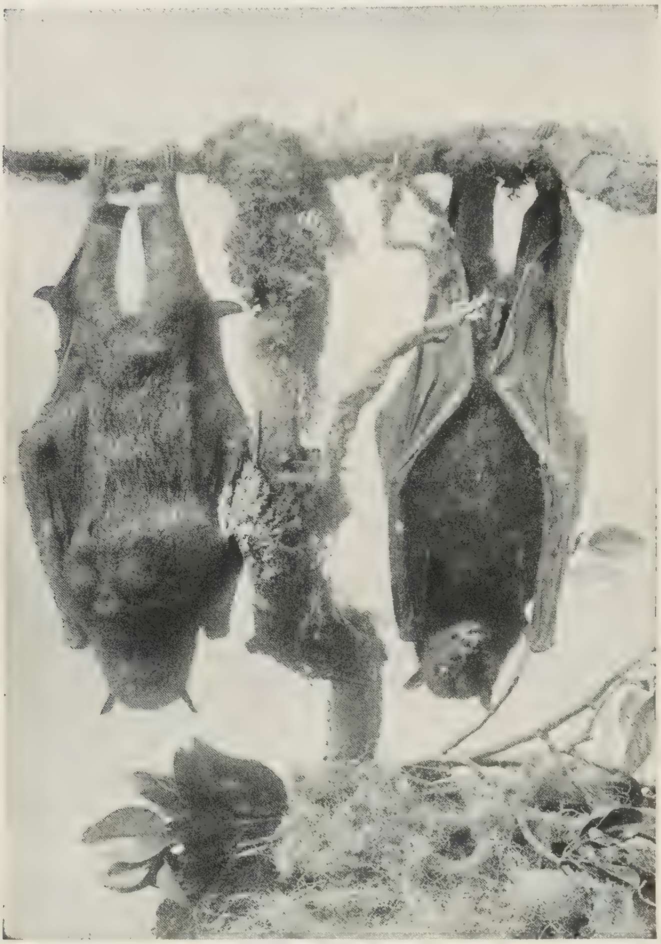


Photo by Henry King] [Sydney

AUSTRALIAN FRUIT-BATS

In their roosting-places these bats hang all over the trees in enormous numbers, looking like great black fruits. Although shot in thousands, on account of the damage they do to fruit orchards, their numbers do not appear to be reduced

The wing-membrane serves yet another purpose, for its sense of touch is exceedingly delicate, enabling even blind bats (for bats are not blind usually, as is popularly supposed) to avoid objects placed in their path. Some bats, however, appear to depend also in some slight degree upon hearing. The sense of touch is still further increased by the development of frills or leaf-like expansions of skin round the nose and mouth, and by the excessive development of the external ears. Delicate hairs fringing these membranes probably act like the " whiskers " of the cat.

Insect-eating bats inhabiting regions with a temperate climate must in winter, when food supplies cease, either hibernate or migrate to warmer regions. The majority hibernate; but two species at least of Canadian bats perform extensive migrations, it is supposed to escape the intense cold.

The power of flight has made the bats independent of the barriers which restrict the movements of terrestrial animals, and accordingly we find them all over the world, even as far north as the Arctic Circle. But certain groups of bats have an extremely restricted range. Thus the Fruit-bats occur only in the warmer regions of the Old World, the Vampires in America, whilst some of the more common insect eating forms are found everywhere. Those forms with a restricted distribution are, it should be noticed, all highly specialised—that is to say, they have all become in some way adapted to peculiar local conditions, and cannot subsist apart therefrom. It is the more lowly—less specialised—forms which have the widest geographical range. There are some spots, however, on the world's surface from which no bat has yet been recorded—such are Iceland, St. Helena, Kerguelen, and the Galapagos Islands.

The Fruit-bats.

These represent the giants of the bat world, the largest of them, the Kalong, or Malay Fox-bat, measuring no less than 5 feet from tip to tip of the wing. The best known of the fruit-bats is the Indian Fox-bat. Sir J. E. Tennent tells us that a favourite resort of theirs near Kandy, in

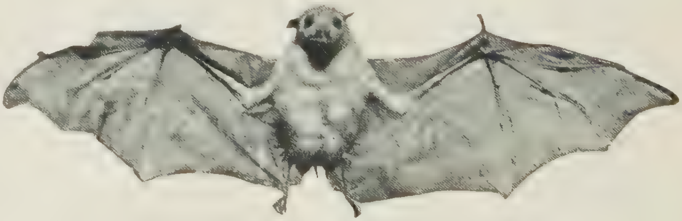


Photo by A. S. Rudland & Sons

TUBE-NOSED FRUIT-BAT

The tubular nostrils distinguish this and a species of insect-eating bat from all other living mammals

Photo by Fratelli Alinari] [Florence

PIPISTRELLE BAT

This is one of the commonest bats. It is the first to appear in the spring, and the last to retire at the fall of the year

Ceylon, was some india-rubber-trees, "where they used to assemble in such prodigious numbers that large boughs would not infrequently give way beneath the accumulated weight of the flock." An observer in Calcutta relates that they occasionally travel in vast hordes, so great as to darken the sky. Whether they are performing some preconcerted migration or bent only on a foray to some distant feeding-ground is a matter for speculation. These hordes are quite distinct from the "long strings" which may be seen every evening in Calcutta on their way to neighbouring fruit-trees.

One of the most remarkable of this group is the Tube-nosed Fruit-bat, in which the nostrils are prolonged into a pair of relatively long tubes. Strangely enough, a group of insect-eating bats has developed similar though smaller tubes. Except in these bats, such tubes are unknown among mammals. Their function is not known.

Insect-eating Bats.

The vast majority of the bats comprising this group feed exclusively on insects. Some, however, have acquired the habit of fruit-eating, like the true fruit-bats; and a few have developed quite ogre-like habits, for they drink blood—indeed, they subsist upon nothing else. This they obtain from animals larger than themselves.

Many of the bats of this group have developed curious leaf-like expansions of skin around the nose and mouth, which are supposed to be endowed with a very delicate sense of touch. In some, as in the Flower-nosed Bat, the nose-leaf is excessively developed, forming a large rosette. The upper border of this rosette is furnished with three stalked balls, the function of which it is surmised is probably ornamental—from the bat's point of view. To our more æsthetic taste the whole effect is hideous.

Photo by A. S. Rudland & Sons

LEAF-NOSED BAT

The leaf-nosed are the most highly organised of all the bats. The remarkable leaf-like folds of skin around the nose or chin, as the case may be, serve as delicate organs of perception. There are numerous species of leaf-nosed bats

Limited as is our space, we cannot pass over the Sucker-footed Bats. These are met with, strangely enough, in countries so far apart as Brazil and Madagascar. The suckers from which they derive their name, in the Brazilian species, are small circular, hollow disks, attached to the thumb and the sole of the foot, recalling the suckers of the cuttle-fish and brown water-beetle. By their means the animal is enabled to climb over smooth vertical surfaces.

A white bat is a rarity in the bat world. We cannot therefore afford to pass without mention the fact that Central and South America possess two species of White Bats. This colour is probably developed for protection's sake, the bats being found nestling between the silvery leaves of a cocoanut-palm. Brilliant coloration, on the other hand, is by no means so rare. Welwitsch's Bat, for instance—a West African species—is remarkable for its gorgeous coloration, the colours being orange and black. An Indian species, known as the Pointed Bat, is said to be so brilliantly coloured as to resemble a gorgeous butterfly rather than a bat.

Ugliness is more common than beauty amongst the bats, and perhaps the ugliest of all the tribe is the Naked Bat of the Malayan region. It is absolutely repulsive. The skin is naked, save for a collar of hair round the neck; whilst on the throat it gives rise to an enormous throat-pouch, which discharges an oily fluid of a peculiarly nauseating smell. On either side of the body is a deep pouch, in which the young are carried—a very necessary provision, for they would be quite unable to cling to the body of the parent, as do the young of fur-bearing bats, on account of the naked skin.

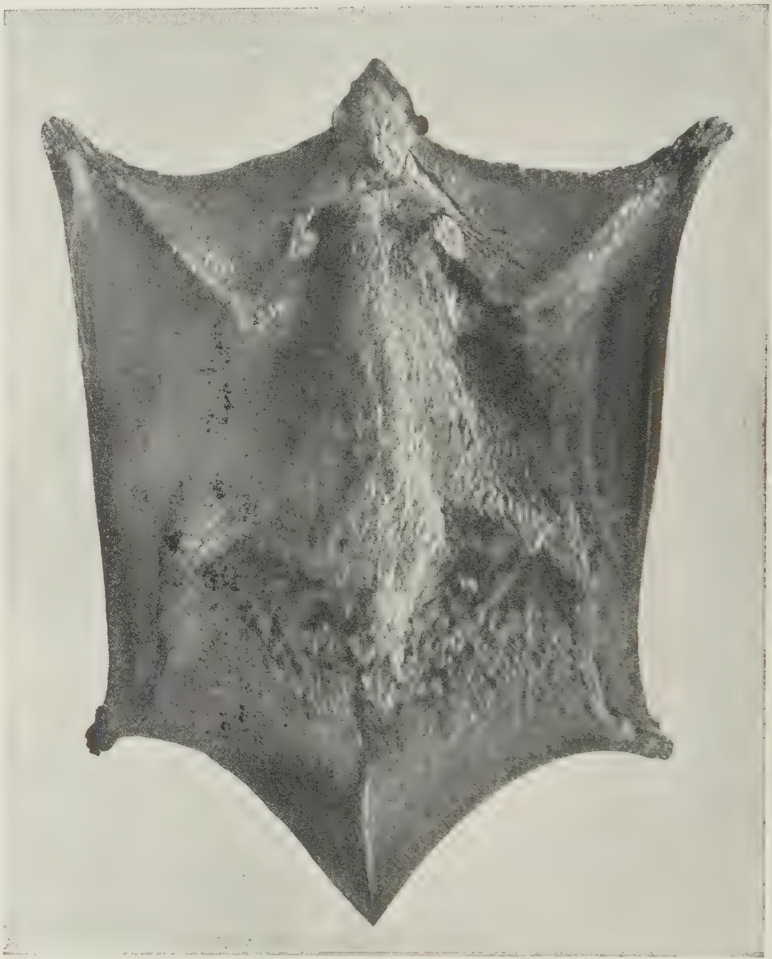


Photo by W. Saville-Kent, F.Z.S.] [*Croydon*

COBEGO

Back view of the cobego, with the limbs extended, showing the great size of the flying-membranes, or parachute

Of the great group of the Vampire-bats we can only make mention of the blood-sucking species. These are natives of South America. It is to Dr. Darwin that we owe our first absolutely reliable information about these little animals. Before the account in his Journal, it was uncertain to which of the vampires belonged the unenviable distinction of being the blood-sucker. During the stay of the great naturalist in Chili one was actually caught by one of his servants, as evening was drawing on, biting the withers of a horse. In the morning the spot where the bite had been inflicted was plainly visible, from its swollen condition. These two species, it has been stated, "are the only bats which subsist entirely on a diet of blood, yet it is possible that . . . some of the Javelin-bats or their allies may on occasion vary their ordinary food with it."

The Insectivora, or Flightless Insect-eaters.

Some members of this group have departed from the traditional insect diet. Thus the cobego feeds upon leaves, a curious aquatic shrew—the Potamogale of West Africa—upon fish, and the moles upon worms.

The group has a very wide geographical distribution, but there are nevertheless large portions of the globe in which they are conspicuous by their absence. They are never found in Australia or South America. Madagascar, Africa, and the West India Islands produce the most remarkable forms.

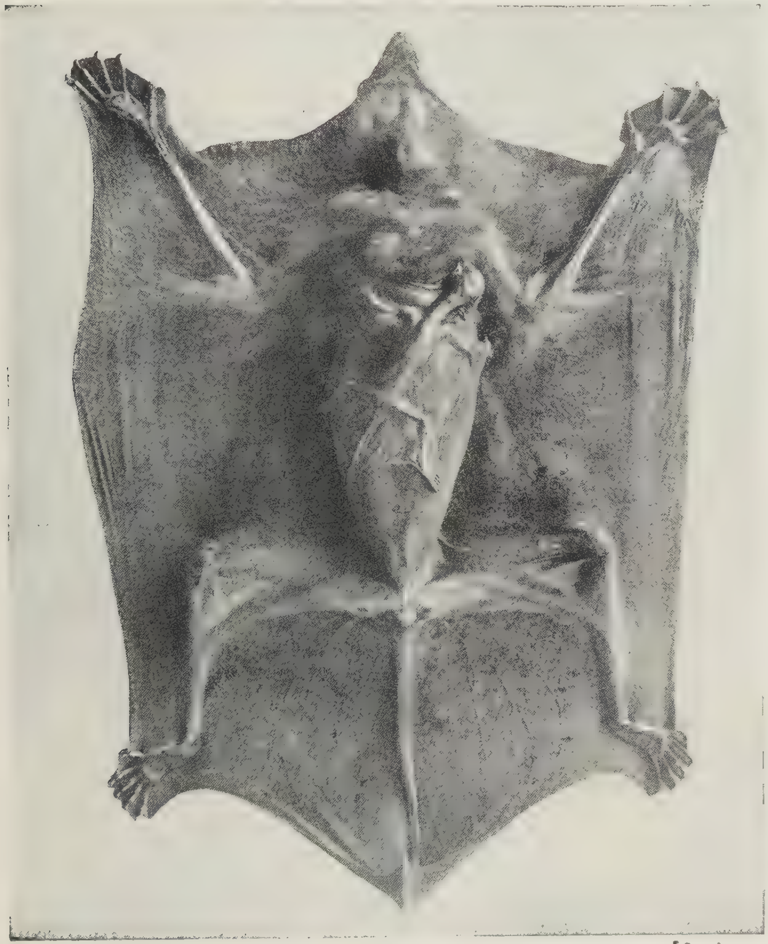


Photo by W. Saville-Kent, F.Z.S.] [Croydon

COBEGO

Vertical (front) view of the cobego, with newly born and naked young attached. Note the extension of the membrane between the toes of the fore feet of the adult

The Cobego.

This is a peculiarly interesting animal, which lives in the forests of Sumatra, Borneo, the Malay Peninsula, and the Philippine Islands. It dwells among the trees, moving from one to another by taking flying leaps through the air, covering as much as seventy yards at a jump. Prodigious leaps like this would be quite impossible but for the fact that the animal, which is almost as large as a cat, is provided with a sort of parachute, formed by a broad web of skin stretched between the body on either side and the fore and hind limbs, and between the hind limbs and the tail.

Shrews, Hedgehogs, and Tenrecs.

The variation in form presented by the members of this group is considerable. The most noteworthy examples of this variation are furnished by the pretty little squirrel-like Tree-shrews of India and Borneo and neighbouring lands, the mouse-like Jumping-shrews of Africa, the Hedgehogs, the Tenrecs, the elegant little Mouse-like Shrews of almost world-wide distribution, and the Water-shrews. Of these, hedgehogs and tenrecs have undergone the greatest transformation. By a curious modification of their original hairy covering they have developed a formidable armour of sharp spines. When alarmed, the former roll themselves up into a ball by the contraction of powerful muscles, and so present an almost impregnable armour to an enemy. Stoats and foxes, however, appear at least occasionally to succeed in overcoming this defense and making a meal of the vanquished.

Tenrecs are found in Madagascar. The Common Tenrec is the largest of all insect-eaters.

and one of the most prolific, as many as twenty-one having been produced at birth. Of all living mammals it is the one most nearly allied to the Marsupials.

The Moles.

The Common Mole shows a most perfect adaptation to its underground mode of life. The general form of the animal is long, cylindrical, and pointed in front, whilst the legs are exceedingly short, the foot only in the fore limb projecting from the body. This foot is very broad and spade-like and immensely powerful, its use being to force a way —often with incredible speed—through the soft, yielding soil, and not to support the body, as in running or walking. The hind feet are weak, but resemble those of its allies the shrews, for instance. The eyes have become reduced to mere vestiges, very difficult to find. The fur has become so altered in structure that it will lie equally smooth whether brushed towards head or tail, so that it should not be damaged when the animal travels backwards in its burrow. External ears have been dispensed with.

Worms form the staple diet of the mole, but besides underground insects of all kinds are greedily devoured. This animal is one of the most voracious feeders, falling ravenously upon its prey. It has been said with truth that so great is the ferocity displayed by the mole that if it could be magnified to the size of the lion it would be one of the most terrible of living creatures. That a constant supply of food is necessary to satiate its enormous appetite is shown by the fact that a mole will succumb to an abstinence of from ten to twelve hours. Moles fight among themselves furiously; and if two are confined together, the weaker will be attacked and devoured. They take readily to the water, and instances of moles observed in the act of crossing streams are numerous.

It is a curious fact, but the mole is unknown in Ireland; yet it ranges from England in the west through Asia to Japan.

Careful observation seems to have shown that with the common mole males are more numerous than females. Whether this is true of other species remains to be seen.

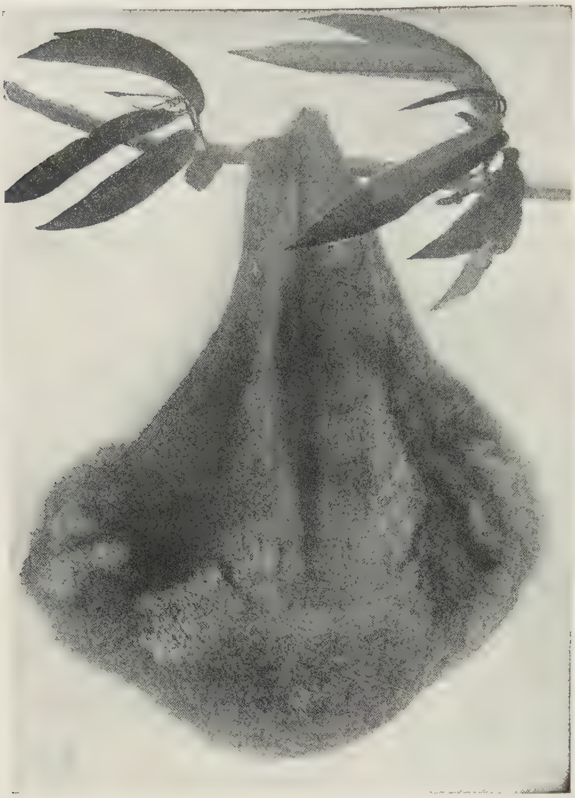


Photo by W. Saville-Kent, F.Z.S.] *[Croydon*

COBEGO ASLEEP

All four limbs are used in suspending itself when asleep, as in the sloths. In this position the cobego closely resembles, and is mistaken by its enemies for, the fruits of one of the native trees. It is a nocturnal animal

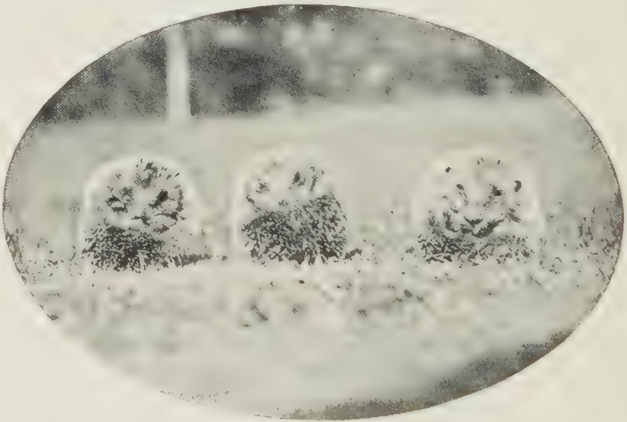


Photo by L. Medland, F.Z.S.] *[North Finchley*

THREE BABY HEDGEHOGS

Young hedgehogs are born blind and naked. The spines on their first appearance are quite soft; they soon harden, and at the same time the power to roll the body up into a ball is acquired

The nearest allies of the moles are the curious aquatic DESMANS of Russia, and the SHREWS.
some of which are quite mole-like in
form, owing to their having adopt-
ed a similar mode of life.
The BURROW- ING SHREWS are
not the only forms in the great group
which have as- sumed a mole-like
shape, for allied to the hedge-hog-like
TENRECS is a re- markable animal
known as the GOLDEN MOLE.
The mole-like shape of the body
of this animal is another instance of
adaptation to a sim- ilar mode of life.
The fore limb of the golden mole is
provided with huge claws, which are
used for digging purposes; the hand
is not broadened out spade-like, as
in the common mole, the claws
rendering this un- necessary.

Photo by A. S. Rudland & Sons

GOLDEN MOLE

This is found only in South Africa. The name is derived from the wonderful metallic lustre of the fur: the brilliancy of the hues is intensified by immersion in spirit

CHAPTER XI.

THE ELEPHANT, TAPIR, HYRAX, AND RHINOCEROS.

THE ELEPHANT.

BY F. C. SELOUS.

Photo by M. E. F. Baird, Esq.

A FINE TUSKER

The male Indian elephant has smaller tusks than the African species

At once the mightiest and most majestic of all terrestrial mammals, the elephant appeals to the imagination more forcibly than any other living animal, not only on account of its great sagacity and the strangeness and singularity of its outward appearance, but also because it is such an obvious link between the world of to-day and the dim and distant past of Pleiocene and Miocene times.

There are two existing species of elephant, the African and the Asiatic, the latter, from the structure of its molar teeth and the shape of its skull, appearing to be very nearly related to the Mammoth, which lived upon the earth in comparatively recent times—geologically speaking—and was undoubtedly contemporary with man in Europe during the Stone Age.

There are very considerable differences both in the external appearance and also in the habits of the two existing forms of elephant. In the African species the forehead is more convex and the eye relatively larger than in its Asiatic cousin; and whilst the ears of the latter are only of moderate size, those of the former are so large that they at once arrest the attention, and are one of that animal's most remarkable external characteristics. Both sexes of the African species, with few exceptions, carry well-developed tusks, but in the Asiatic form the tusks of the females are so small as scarcely to protrude beyond the jaws. In Asia, too, tuskless bull elephants are common, whilst males of the African species without tusks are extremely rare. The latter species has but three nails on the hind foot, the Asiatic elephant four. In the African species the middle of the back is hollowed, the shoulder being the highest point, whilst in the Asiatic elephant the back is arched, and the top of the shoulder lower than the highest part of the back. The extremity of the proboscis is also different in the two species, the African elephant being furnished with two nearly equal-sized prolongations, the one on the front, the other on the hinder margin, with which small objects can be grasped as with the finger and thumb of the human hand, whilst in the Asiatic species the finger-like process on the upper margin of the end of the trunk is considerably longer than that on the under-side. In external appearance the skin of the African elephant is darker in colour and rougher in texture than that of the Asiatic form. The molar teeth of the former animal are, too, of much coarser construction, with fewer and larger plates and thicker enamel than in the latter, which would naturally lead one to suppose that the

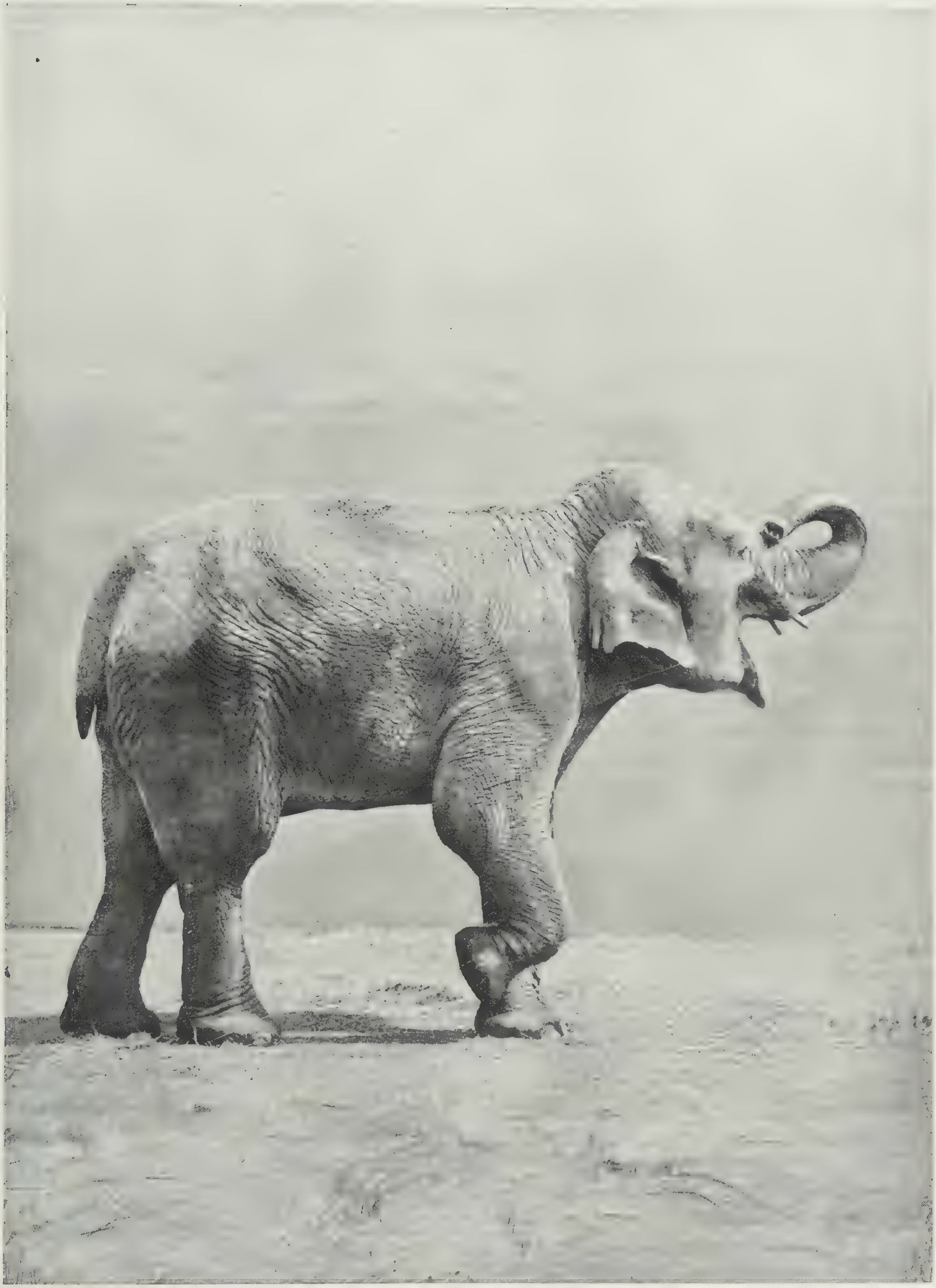


Photo by Fratelli Alinari] [*Florence*

A YOUNG INDIAN ELEPHANT

This animal has been trained to "salute" by raising its trunk and foot. It has lost the end of its tail

African elephant is accustomed to eat coarser, harder food than the Asiatic species. This supposition is borne out by fact; for whilst the Asiatic elephant feeds mainly upon grass, the leaves and fruit of the wild plantain, and the young shoots of the bamboo, together with the leaves, twigs, and bark of certain trees, the African species never eats grass, and, although very fond of certain kinds of soft and succulent food, such as wild fruits and the inner bark of certain trees, is constantly engaged in chewing up the roots and branches of trees as thick as a man's wrist for the sake of the sap and bark, the woody portions being rejected after having been reduced to pulp. The Asiatic elephant appears to be far less tolerant of exposure to the heat of the sun than the African; and whilst the latter may often be found standing at rest or sleeping throughout the hottest hours of the day in long grass or scrubby bush of a height not sufficient to afford any protection from the sun to the whole of the upper portion of the head and body, the former, when in a wild state, is said to always seek the shade of the densest forests it can find during hot weather.

The Asiatic elephant often lies down when resting and sleeping. This is in marked contrast to the African species, which, if it ever does lie down at all, except to roll in mud or rub itself against an ant-heap, can only do so very rarely, since in all my experience, though I have seen some thousands of African elephants standing sleeping during the heat of the day, I have never yet seen one of these animals lying down, nor found the impress in the ground where one had been so lying.

When excited and charging, both species of elephant raise their heads and cock their ears, which in the African animal stand out at such a time like two sails, and, being each upwards of 3½ feet in breadth, cover, together with the animal's head, an expanse of fully 10 feet. The Asiatic elephant is said to remain mute whilst charging, and to hold its trunk tightly curled up between its tusks. The African elephant, on the other hand, usually accompanies a charge with a constant succession of short, sharp trumpeting screams. Sometimes, though rarely, however, animals of this species remain mute whilst charging, but they never, I believe, coil their trunks up under their throats. Often an African elephant will swing round for a charge with a loud scream and trunk held high in the air; but in my experience, when settling down to a chase, it drops its trunk and holds it pointing straight down in front of its chest.

In the southern portions of the African Continent the average standing height at the shoulder of full-grown bull elephants ranges from 10 feet to 10 feet 6 inches, though individuals have doubtless been met with in those districts which have much exceeded these dimensions. In North Central Africa the average standing height appears to be some inches higher, approaching 11 feet, and in those districts it is quite possible that individuals exist which exceed 12 feet in height. African cow elephants stand from 8 feet to 8 feet 6 inches at the shoulder. The Asiatic species is considerably smaller than the African, the average height of full-grown males not exceeding 9 feet, though certain individuals now and then attain to a much greater size, as is indicated by the fact that there is a mounted skelton of an Indian elephant in the Museum at Cal-

Photo by M. E. F. Baird, Esq.

THE CHIEF OF CHIENGMAI'S CARRIAGE

This victoria was drawn by a young Indian elephant

Photo by M. E. F. Baird, Esq.

TIMBER-ELEPHANTS

This photograph was taken at Lakou, in Upper Siam. Notice the large teak log in the foreground

cutta which stands 11 feet 3 inches at the shoulder. In the size of its tusks the African elephant far surpasses the Asiatic species. In India a pair of tusks measuring 5 feet in length and weighing 70 lbs. the pair would, I think, be considered large, though an elephant was killed by Sir Victor Brooke in the Garo Hills with a single tusk measuring 8 feet in length, 17 inches in circumference, and weighing 90 lbs., and a few tusks even exceeding these dimensions have been recorded. In Southern Africa the tusks of full-grown bull elephants usually weigh from 80 to 120 lbs. the pair, and measure about 6 feet in length, with a circumference of from 16 to 18 inches; but these weights and measurements have often been much exceeded, and in my own experience I have known of two pairs of elephants' tusks having been obtained south of the Zambesi, each of which weighed slightly over 300 lbs., each tusk measuring upwards of 9 feet in length, whilst a single tusk brought from the neighbourhood of Lake Ngami in 1873 weighed 174 lbs. The average weight of cow-elephant tusks in Southern Africa is from 20 to 30 lbs. the pair, but I have seen the tusk of a cow elephant killed in Matabililand which weighed 39 lbs. and measured over 6 feet in length, whilst its fellow almost equaled it in size and weight. In North Central Africa, according to Sir Samuel Baker, the tusks of full-grown elephants average about 140 lbs. the pair, and tusks weighing upwards of 100 lbs. each are not at all uncommon, whilst many of a much greater size have been obtained.

Until quite recently a tusk in the possession of Sir E. G. Loder, which weighs 184 lbs. and measures 9 feet 5 inches in length, with a circumference of 22½ inches, was supposed to be the largest in existence; but in 1899 two tusks were obtained near Kilimanjaro, in East Central Africa, both of which much exceed this weight. These enormous tusks were at first stated to be a pair taken from a single elephant; but though nearly equal in weight they are said to be differently shaped, and as their history is not yet fully known it is possible, though not probable, that they originally belonged to two different elephants. The larger of these two tusks has recently been purchased for the collection of the British Museum (Natural History), where it may now be

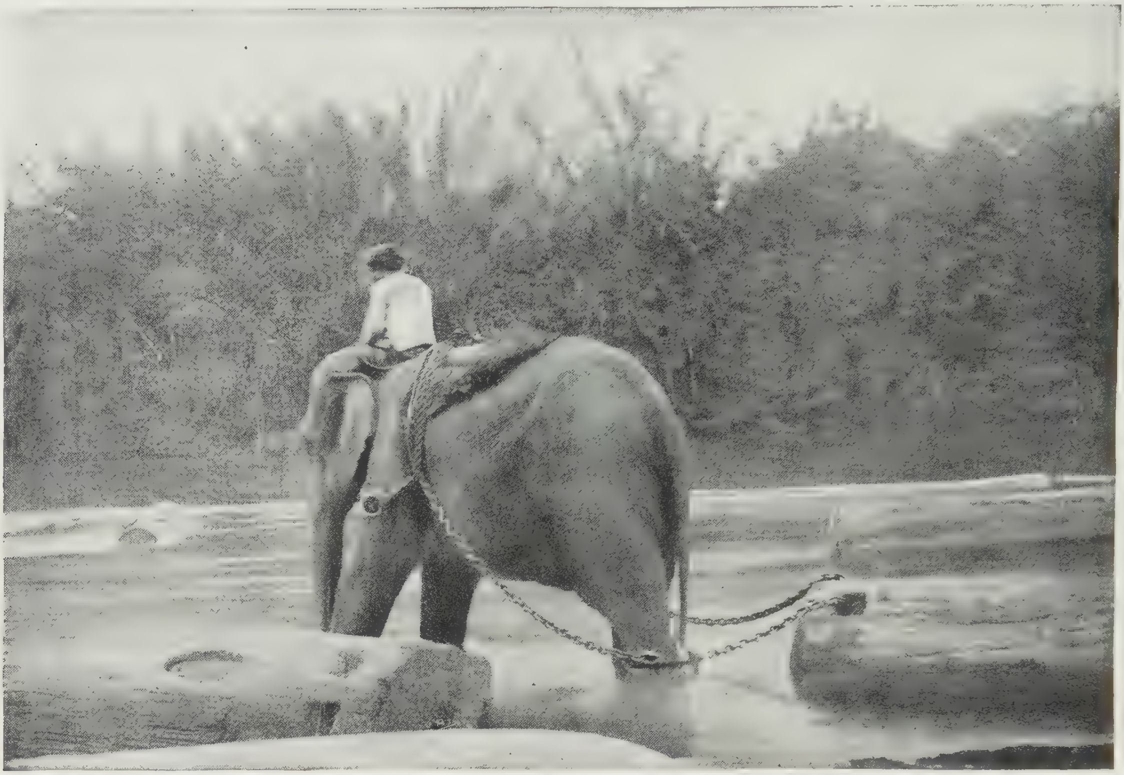


Photo by M. E. F. Baird, Esq.

FEMALE INDIAN ELEPHANT DRAGGING TEAK

The teak logs are floated down the Burmese rivers and dragged out by elephants

seen. It weighs 228 lbs., measures 10 feet 2½ inches on the outside curve, and 24¼ in girth at the thickest part. The tusks of cow elephants are also considerably larger and heavier on the average in East Central and North Central Africa than in the southern portions of the continent.

At the present time the Asiatic elephant is found in a wild state in most of the forest-covered tracts of India, Ceylon, Assam, Burma, Siam, Cochin-China, Sumatra, and Borneo; whilst the African species, although it has been hunted out of large tracts of country in South and Southwestern Africa, still inhabits the greater part of the continent south of the Sahara, and in many districts of Central Africa appears to be extraordinarily abundant. In the Cape Colony two herds still exist under the protection of the Government.

As might be expected from the greater length of its legs, and consequent longer stride, the African elephant is admitted by those who have had experience of both species to be a more active animal than its Asiatic cousin. Speaking of the walking and running powers of the Indian elephant, that great authority Mr. Sanderson says that "the only pace of the elephant is the walk, capable of being increased to a fast shuffle of about fifteen miles an hour for very short distances. It can neither trot, canter, nor gallop. It does not move with the legs on the same side, but nearly so. A very good runner might keep out of an elephant's way on a smooth piece of turf, but on the ground in which they are generally met with any attempt to escape by flight, unless supplemented by concealment, would be unavailing." This description exactly coincides with my own experience of the African elephant, except that I think that animals of the latter species, especially cows and young bulls, are capable of getting up a pace of at least twenty miles an hour, and keeping it up for from 100 to 200 yards, when charging.

In disposition both African and Asiatic elephants are as a rule timid animals, and, excepting in the case of males of the latter species when suffering from sexual excitement, are always inclined to shun danger. I have never heard of male elephants of the African species becoming savage and aggressive at any season of the year; indeed, old bulls always appeared to me to be less inclined to charge than cows or young bulls. The eyesight of the elephant—of the African species at least—is bad, and his hearing not particularly acute; but his olfactory nerves are probably more highly developed than in any other animal, and, aided by this exquisite sense of smell, he will avoid a human being if possible. But if elephants are attacked and wounded, they become savage and dangerous animals; and the charge of an African elephant, coming on with the great ears outspread, to the accompaniment of a quick succession of short, sharp trumpeting screams, besides being very sudden and rapid, is very disconcerting to the nerves of a man unaccustomed to such experiences. I remember the case of a young Englishman who was killed in Matabililand many years ago by the first elephant he had ever seen. This animal—an old bull—had retired, after having been wounded, into a small but dense patch of thorn-bush, into which its pursuer thought it unadvisable to follow on horseback. He therefore left his horse, and advanced on foot towards the cluster of trees amongst which the elephant was concealed. The latter, having either seen or smelt the approaching enemy, at once charged out, screaming loudly; and the young hunter, instead of standing his ground and firing at the advancing monster, lost his presence of mind, and, turning, ran for his horse; but before he reached it he was overtaken and killed. It seemed to the friend who found his body (he was close at hand shooting another elephant at the time, and pieced the story together from the tracks of man, horse, and elephant) that the victim had first been struck in the back of the head by one of his pursuer's tusks—at any rate his skull had been smashed to pieces and emptied of its brains. Then the elephant had rushed upon him where he fell, and, after first having driven a tusk right through his chest and deep into the ground, had stamped him into a bloody pulp with his huge

Photo by M. E. F. Baird, Esq.

INDIAN ELEPHANTS BATHING

These animals love a bath, and will walk on the bottom of a deep river with only their trunks raised above the water feet. A waggon was brought the same night, and the mangled body carried to the hunter's camp on the banks of the Ramokwebani, where it was buried.

The strength of the elephant is proverbial; and in India and Burma, where this animal has for ages past been trained in the service of man, this power is habitually made use of in moving and stacking large baulks of timber, or in dragging heavy guns through muddy ground or up steep ascents. In Africa the traveler is often astonished at the size of trees which have been uprooted and overturned by elephants. These trees, however, have no tap-root, and have not therefore a very firm hold in the ground, especially during the rainy season, when the ground is soft. At this time of year large trees are butted down by elephants, which push against their stems with the thick part of their trunks, and get them on the swing, until the roots become loosened and the trees are at last overturned. Small trees of 2 or 3 inches in diameter, as well as branches, they break off with their trunks. In 1878 a tuskless bull elephant—I met the same animal again in 1885, and he is the only African bull elephant without tusks I have ever seen—killed a native hunter in Mashonaland. This man, a big powerful Zulu and a great friend of my own, was torn into three pieces. I imagine that, after having caught him, the elephant held the unfortunate man down with his foot or knee, and then, twisting his trunk round his body, tore him asunder—surely a terrible exhibition of strength.

The elephant is a very slow-going and long-lived animal, not arriving at maturity until upwards of thirty years of age; and since cases are on record of elephants having lived for upwards of 130 years in captivity in India, it is probable that in a wild state these animals, both in Asia and Africa, often attain to an age of 150 years. The female elephant produces, as a rule, but one calf at birth, the period of gestation lasting from eighteen to nearly twenty-two months. The mammæ of the cow elephant are placed between the fore legs, and the new-born calf sucks with its mouth, holding its trunk turned back over its head. I have seen elephant calves so engaged.

Although there is no reason to doubt that the African elephant is as intelligent as the Asiatic species, its domestication has never been attempted by the Negro or Bantu races of Africa. It is believed, however, that the African elephant was in ancient times domesticated by the Carthaginians, and used by them in their wars with the Romans. The opinion, too, is generally held that the elephants with which Hannibal crossed the Alps were of the African species, as well as those which, after the conquest of Carthage, were used in the Roman amphitheatres and military pageants. On the other hand, it is well to remember that the late Mr. W. Cotton Oswell, who had had great experience both with African and Asiatic elephants, wrote as follows on this subject: "I believe some people suppose the Carthaginians tamed and used the African elephant they could hardly have had mahouts Indian fashion, for there is no marked depression in the nape of the neck for a seat, and the hemming of the ears when erected would have half smothered them. My knowledge does not allow me to raise any argument on this point; but might not the same market have been open to the dwellers at Carthage as was afterwards to

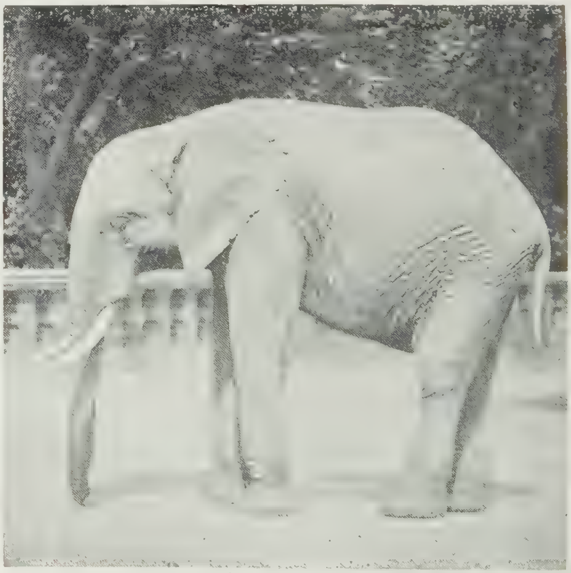


Photo by J. W. McLellan] *[Highbury*

AFRICAN ELEPHANT

The difference in profile between this and the Indian species is noticeable. The forehead is receding and the ears much larger in the African species

Mithridates, who, I suppose, drew his supply from India? I know in the representations of elephants on the medals of Faustina and of Septimus Severus the ears are African, though the bodies and heads are Indian; but these were struck nearly 400 years after Carthaginian times, when the whole known world had been ransacked by the Romans for beasts for their public shows; and I still think it possible that the Carthaginians—the great traders and colonisers of old—may have obtained elephants through some of their colonies from India."

An interesting example of the intelligence of these animals can be seen any day at the public Zoological Gardens. A large African elephant restores to his would-be entertainers all the biscuits, whole or broken, which strike the bars and fall alike out of his reach and theirs in the space between the barrier and his cage. He points his trunk at the biscuits, and blows them hard along the floor to the feet of the persons who have thrown them. He clearly knows what he is doing, because, if the biscuits do not travel far enough, he gives them a harder blow.

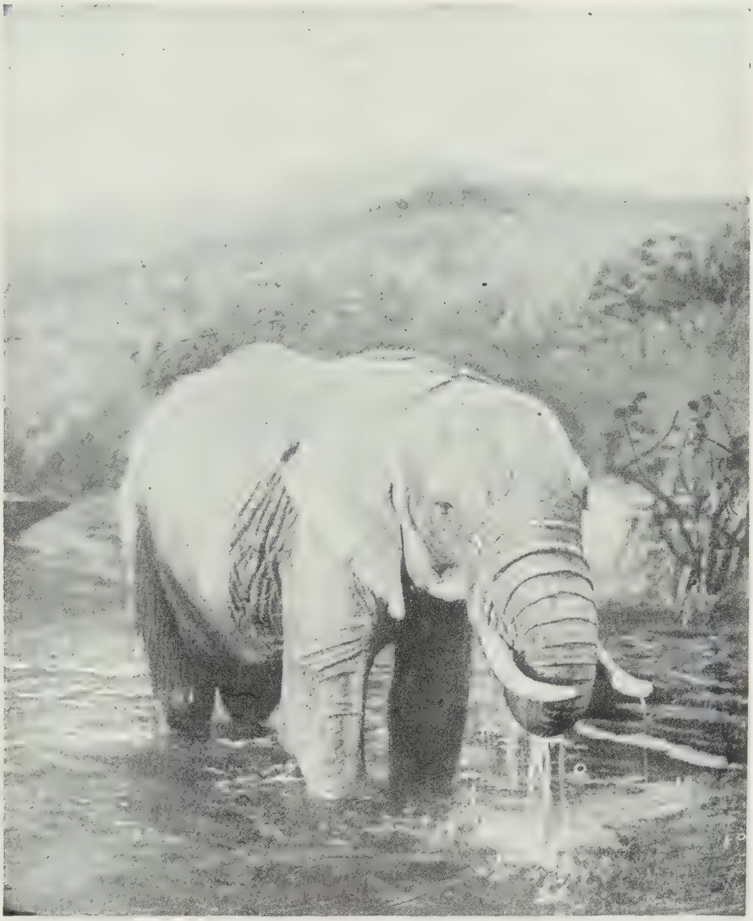


Photo by L. Medland, F.Z.S.] *[North Finchley*

MALE AFRICAN ELEPHANT DRINKING

Not the great size of the tusks and base of the trunk

TAPIRS AND HYRAX.

BY W. P. PYCRAFT, A.L.S., F.Z.S.

Tapirs are odd-looking creatures, and, strange as it may seem, are nevertheless related on the one hand to the rhinoceroses, and on the other to the horses. They are furthermore extremely interesting animals, because they have undergone less modification of form than any other members of the group to which they belong. This we know because fossil tapirs, belonging to a very remote period of the world's history, are practically indistinguishable from those now living.

The general form of the body may perhaps be described as pig-like; the head, too, suggests that animal. But the pig's snout is here produced into a short proboscis, or trunk. The feet are quite unlike those of the pig, and resemble those of the rhinoceros. The fore feet have each four and the hind feet three toes; these are all encased in large horse-like hoofs. The tail is reduced to a mere stump.

Tapirs are shy and inoffensive animals, living in the seclusion of dense forests in the neighbourhood of water, in which element they are quite at home; indeed, it is said that they will frequently dive and walk along the bed of the river. They are also fond of wallowing in mud,

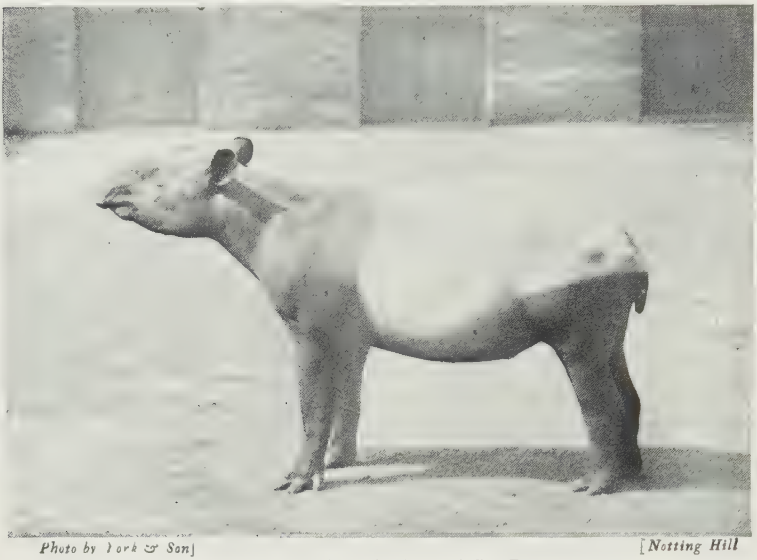


Photo by York & Son] *[Notting Hill*

MALAYAN TAPIR

The largest of all the tapirs. Is easily distinguished from the American tapirs by the patch of white on the middle of its body

partly, it is believed, that they may encase themselves with it as a protection against the annoyance of flies. They feed on shoots of trees, bushes, leaves, and fallen fruits, foraging during the evening, and possibly far into the night.

Tapirs are hunted by the natives for the sake of their thick hides, which are cut into thongs for reins and bridles. The flesh also is esteemed by some. There are three methods of capture. In South America the lasso is used with occasional success. But when not foiled by undergrowth, the hunter often loses his victim by reason of the violence and force of its rush, which snaps the thong. The Gauchos intercept it with dogs on its way to the water, when it will fight furiously, and many dogs may be killed before its dispatch is accomplished. Others imitate its peculiar, shrill call, and shoot it on its approach in answer thereto. Captives are easily tamed, and may be seen walking about the streets in many South American towns. They wander into the forest by day, returning in the evening to be fed, and are said to display great affection. On account of their great strength, it has been suggested that such captives should be used as beasts of burden.

Except the Malayan Tapir, which is black and white, tapirs are black or dark brown in colour, and but scantily clothed with hair; but the young, it is interesting to note, are spotted and striped with white or fawn-colour on a dark ground, a coloration recalling that of the wild pig.

There are five different species of tapir. Their geographical distribution is remarkable, four species being South American, and one belonging to the Malayan region. But far back in the world's history, as we know from fossils, tapirs roamed over the warm and temperate regions of Europe, and their remains have been found in China and the United States. Thus the intervening gaps existing to-day have been made by the extinction of these intermediate species.

By nature the tapir appears to be a harmless and inoffensive animal, flying even before the smallest dog. Occasionally, however, it displays great courage and ferocity, and this appears to be especially the case with females deprived of their young. At such times they will charge with great spirit, and knock down, trample on, and bite their victim after the fashion of wild swine.

Man alone excepted, the most deadly foe of the American Tapir is the jaguar, as is the tiger of the Malay species. The American tapir often gets rid of the jaguar by rushing at full speed into the dense jungle, thus sweeping its assailant from its back, the jaguar's claws finding but an insecure hold on its victim's thick hide. Tapirs are often found bearing scars all over the back, witnessing the terrible nature of the wounds received at such times.

That the tapir is a comparatively unknown animal is partly accounted for by the fact that it is but little sought after by the big-game hunter—who finds more excitement in pursuit of its larger relative the rhinoceros—and partly, perhaps, owing to its inhabiting regions comparatively little visited by Europeans. Nevertheless, the tapir is an animal of quite peculiar interest, having undergone but little change during long ages, whilst its ally the horse has effected in the same time a complete transformation, not only in its general shape, but more especially in its teeth and feet. The gradual steps by which this transformation has been brought about we can trace through certain fossil forms, of which we can say little here.

Amongst these fossils occur remains of an animal bearing a very strong resemblance to the living tapir, but which, strangely enough, is not really so closely related thereto as to the horses. It does not, however, stand in the direct line of descent of these latter, but must be regarded as representing a collateral branch thereof. The occurrence of this distinct tapir-like animal is of great scientific interest.

The short, stout legs and spreading toes of the living tapirs, rhinoceroses, and ancestral horse are admirably adapted for plodding deliberately over soft and yielding ground, such as is afforded by reed-beds and banks of rivers, or the shady depths of forests. Speed in such surroundings is not necessary, food in plenty being always at hand, and escape from enemies being sought by concealment in thick herbage rather than flight. With a migration to drier and higher plains, the spreading foot has undergone a change. The short legs and numerous toes have given place to long ones, and of the several toes growth has taken place in one only—the third; whilst the others have slowly dwindled, till eventually only traces of the second and fourth remain, as in the modern horse. Thus has a firmer support over hard, unyielding ground been brought about, and great speed gained. The animals with this type of foot (in which the third is the largest toe) are known as the Odd-toed Hoofed Animals. The pigs, sheep, deer, and oxen have gained an equally efficient foot, yet retaining four toes. Of these, the third and fourth are equal in size, and serve as a support to the body, whilst the second and fifth have now become functionless, and do not reach the ground. This type of foot characterises that group of the hoofed animals known as the Even-toed.

THE HYRAX.

This is one of the most remarkable of living mammals, and one of the greatest puzzles to zoologists, having no near living relatives. Though bearing some resemblance to an earless rabbit, it really belongs to the hoofed animals, and amongst them comes perhaps somewhat nearer the rhinoceros than to any other animal. It is the CONEY of the Bible. It inhabits the rocky districts of Syria and parts of Africa. It is a vegetable-feeder, and very wary. About a dozen species are known.

Photo by G. W. Wilson & Co., Ltd.]

COMMON AMERICAN TAPIR

This tapir inhabits tropical America. It is a nocturnal animal, frequenting the depths of shady forests in the neighbourhood of water, to which it frequently resorts for the purpose of bathing, or as a refuge from pursuit

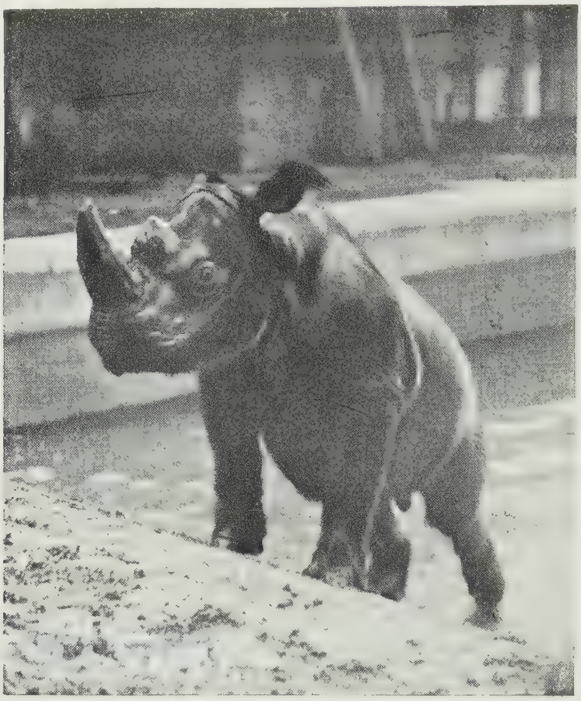


Photo by W. P. Dando

HAIRY-EARED SUMATRAN RHINOCEROS

This species is found in Eastern Bengal and in the Malay Peninsula and adjacent large islands

THE RHINOCEROS.

BY F. C. SELOUS.

Of the five existing species of Rhinoceros, three are found in Asia, whilst two are inhabitants of Africa.

Of the three Asiatic species, two, the Indian and the Javan, are one-horned, and have a single pair of broad incisor teeth in the upper jaw, and a pair of sharp-edged and pointed tusks in the lower, the nasal bones being long and narrow, and terminating in a point. In both these species the skin is hairless (except for tufts or fringes at the extremity of the tail and on the edges of the ears), and is arranged in shield-like folds over the body. The arrangement of these folds, however, differs somewhat in the two species, and the large round tubercles with which the skin of the great Indian rhinoceros is profusely studded are wanting in the Javan species.

The Indian Rhinoceros inhabits the Terai at the foot of the Himalaya from Bhutan to Nepal, and is said to be very abundant in Assam and the Bhutan Dooars. It frequents swampy ground, and lives amongst jungles and dense growths of reeds and grass, which attain a height sometimes of 20 feet, and cover vast areas of ground in the valley of the Brahmaputra and other rivers.

Owing to the nature of the country in which it lives, the Indian rhinoceros cannot often be hunted with much prospect of success, except with the aid of elephants, which sagacious animals are not only employed to carry the hunters, but are also used to beat the great grass jungles in which the rhinoceroses lie hidden, and drive them towards the guns.

Despite its great size and strength, the Indian rhinoceros seems to be regarded as, in general, a timid and inoffensive animal, and even when wounded it seldom charges home. Elephants, however, appear to be as a rule nervous when in the near proximity of rhinoceroses, perhaps objecting to the smell of those animals. When the Indian rhinoceros does make good its charge against either man or elephant, it cuts and rips its enemy with its teeth, and makes little use of its horn as an offensive weapon.

The Indian rhinoceros is said to live principally, if not entirely, on grass and reeds. As a rule it is a solitary animal, but sometimes several are found living in a comparatively small extent of grass-covered plain.

Large males of this species will stand from 5 feet 9 inches to 6 feet at the shoulder, and they are enormously bulky. Both sexes carry well-developed horns, which, however, do not usually attain a length of upwards of 12 inches. There is a specimen in the British Museum measuring 19 inches, and it is believed that in very exceptional instances a length of 2 feet has been attained.

The Javan Rhinoceros, though it has been called the Lesser Indian Rhinoceros, is said by a late authority—Mr. C. E. M. Russell—to stand about the same height at the shoulder as the Indian species. It is found in the Sunderbunds of Eastern Bengal, and has been met with in the Sikhim Terai and in Assam, ranging eastwards through Burma and the Malay Peninsula to Sumatra, Java, and Borneo.

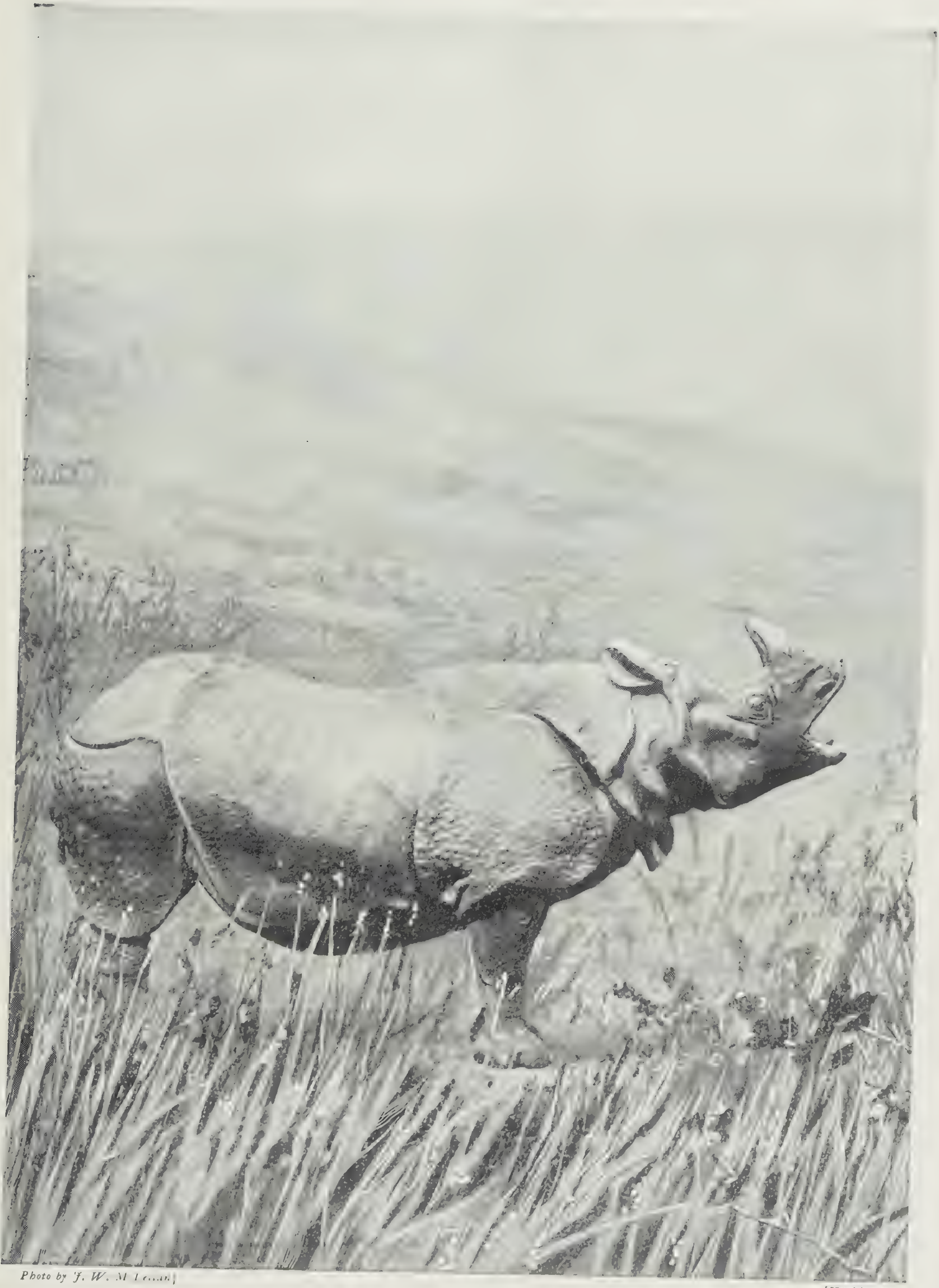


Photo by J. W. M [illegible]] [*Highbury*

GREAT INDIAN RHINOCEROS

The largest land mammal of the East after the elephant

But little appears to be known of the habits of this species of rhinoceros. Although it is found in the swampy grass-covered plains of the Sunderbunds, its more usual habitat seems to be hilly forest-covered country, and both in Burma and Java it ascends to a height of several thousand feet above sea-level. It feeds principally upon leaves and the young shoots of trees and bushes. In disposition it is timid and inoffensive. Only the male carries a horn, which, being very short, is a very poor trophy for a sportsman.

The third Asiatic species of rhinoceros, known as the SUMATRAN, is the smallest of all living rhinoceroses. This species carries two horns, and its skin, which is very rough, is usually thinly covered with hair of a dark brown colour and of considerable length. The folds in the skin of the Sumatran rhinoceros are not nearly so well developed as in its single-horned relatives, and the one behind the shoulders is alone continued over the back. Although furnished with tusks in the lower jaw, the small pair of incisor teeth, which in the other two Asiatic rhinoceroses are always present in front of these tusks, are wanting in the Sumatran species.

The Sumatran rhinoceros is rare in Assam, but is found in Burma and the Malay Peninsula, as well as in Siam, Sumatra, and Borneo. The two horns of this species are placed at some distance apart. Although they are as a rule very short, the front horn occasionally grows to a considerable length, sweeping backwards in a graceful curve.

In height adult males of the Sumatran species stand on the average from 4 feet to 4½ feet at the shoulder, and females sometimes not more than 3 feet 8 inches.

Like the Javan rhinoceros, the Sumatran species is by preference an inhabitant of hilly, forest-covered country, and browses on the leaves and shoots of trees and bushes. It is a timid and inoffensive animal, soon becoming tame in captivity. Its flesh is said to be much appreciated by the Dyaks of Borneo; and as its horns are of value for export to China, where they are used for medicinal purposes, it has of late years very much decreased in numbers in the province of Sarawak, but is more plentiful in Central and North Borneo. Living as it does in dense jungle, it is an animal which is seldom seen by European sportsmen, and its habits in a wild state have never been yet very closely studied.

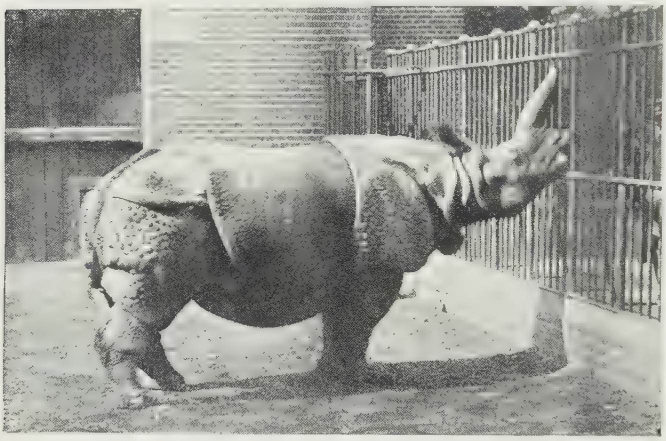


Photo by York & Son] [*Notting Hill*

GREAT INDIAN RHINOCEROS

This species inhabits the grass jungles of Northeastern India

Turning to the two species of rhinoceros which inhabit the continent of Africa, both are double-horned, and neither furnished with incisor teeth, the nasal bones being thick, rounded, and truncated in front. Both, too, are smooth-skinned and entirely hairless, except on the edge of the ears and extremity of the tail, which are fringed or tufted.

Of the two African species, the WHITE or SQUARE-MOUTHED RHINOCEROS is the larger and the rarer. Until quite recently the range of this huge ungainly-looking animal, the biggest of all terrestrial mammals after the elephant, was supposed to be entirely confined to the southern portions of the African Continent; for although from time to time horns had found their way to Zanzibar which seemed referable to the square-mouthed rhinoceros, the fact of the existence of the white rhinoceros in any part of Africa north of the Zambesi remained in doubt until a female was shot in the year 1900, in the neighbourhood of Lado, on the Upper Nile, by Captain A. St. H. Gibbons, who brought its skin, skull, and horns to England. The fact, however, that the

Photo by C. B. Hausburg, Esq.

BLACK AFRICAN RHINOCEROSES

A splendid snapshot of two black African rhinoceroses taken on the open veldt. They were afterwards shot by the party

white rhinoceros has never been encountered by any other traveler in Central Africa seems to show that the animal is either very rare in those districts, or that it has an exceedingly limited range.

In the early years of the nineteenth century the square-mouthed or white rhinoceros was found in large numbers over the whole of South Africa from the Orange River to the Zambesi, except in the waterless portions of the Kalahari Desert, or those parts of the country which are covered with rugged stony hills or dense jungle.

Speaking of his journey in 1837 through the western part of what is now the Transvaal Colony, Captain (afterwards Sir) Cornwallis Harris wrote: " On our way from the waggons to a hill not half a mile distant, we counted no less than twenty-two of the white species of rhinoceros, and were compelled in self-defense to slaughter four. On one occasion I was besieged in a bush by three at once, and had no little difficulty in beating off the assailants." Even so lately as thirty years ago the white rhinoceros was still to be met with in fair numbers in Ovampoland and other districts of Western South Africa, whilst it was quite plentiful in all the uninhabited parts of Eastern South Africa from Zululand to the Zambesi. In 1872 and 1873, whilst elephant-hunting in the uninhabited parts of Matabililand, I encountered white rhinoceroses almost daily, and often saw several in one day. At the present time, however, unless it should prove to be numerous in some as yet unexplored districts of North Central Africa, this strange and interesting animal must be counted one of the rarest of existing mammals, and in Southern Africa I fear it must soon become extinct. A few still exist amongst the wild loquat groves of Northern Mashonaland, and there are also a few surviving in Zululand; but I fear that even with the most rigid protection

Photo by C. B. Hausburg, Esq.

ONE OF THE SAME RHINOCEROSES DEAD

This picture gives some idea of the size of the commonest surviving species they are too few in number to restock the country. They have a better chance, I think, of increasing in numbers in Zululand than in Mashonaland, in which latter country it is at present impossible to afford them any protection either from natives or Europeans.

A full-grown bull white rhinoceros stands from 6 feet 6 inches to 6 feet 9 inches at the shoulder, and is very massively built, with short, stout legs. The head is very much elongated, and the mouth square, like that of an ox. When white rhinoceroses were still plentiful, very considerable differences were observable in the length and shape of their horns. The anterior horns of full-grown bulls might measure from 18 inches to 40 inches in length; those of cows from 24 inches to 60 inches. The longest horn known—that of a cow—which was brought from South Africa by the well-known hunter the late Roualeyn Gordon Cumming, measures 62½ inches over the curve. As a rule, the front horn of the white rhinoceros curved slightly backwards, but was often straight or bent slightly forwards, and sometimes curved strongly backwards. The posterior horn varied from a few inches to 2 feet in length.

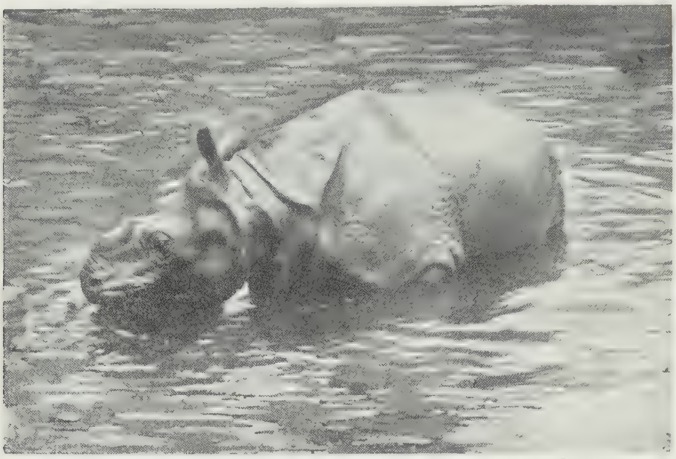


Photo by J. W. McLellan] [*Highbury*

RHINOCEROS BATHING

All the Asiatic species of rhinoceros are fond of bathing and wallowing in mud

The white rhinoceros lived in families, usually a bull, cow, and calf being found together; but there might be two or even three calves of different ages, and of which the youngest alone would be suckling, living with the father and mother. In the early South African spring (September and October), when the young green herbage was just sprouting after the first rains, two or three families of white rhinoceroses might be seen feeding in close proximity, presenting the appearance of a herd; but I fancy the several families of these animals had only been brought together for the sake of the young green grass. In Southern Africa the white rhinoceros lived entirely on grass, and I have never seen any evidence of their having eaten anything else. When either walking, trotting, or galloping, the white rhinoceros always carried its nose close to the ground. A calf always preceded its mother, and she appeared to guide it by holding the point of her horn on the little creature's rump; and in all changes of pace, no matter how sudden, this position was always maintained. The white rhinoceros was easily killed by a shot through the heart or through both lungs, but would travel very long distances, and probably, as a rule, ultimately recover from wounds in other parts of the body. They could travel at a great rate and for a considerable distance with a broken fore leg or shoulder, but if a hind leg were broken they were rendered almost immediately helpless. In disposition they were sluggish and inoffensive animals, lying asleep in the shade of trees or bushes during the heat of the day, and coming to the water to drink at night or often before sundown in parts of the country where they had not been much molested. When disturbed, white rhinoceroses would go off at a swift trot, but if chased on horseback would break into a gallop, which they were capable of maintaining for a considerable distance, and at a wonderful pace for so large and heavy an animal. The meat of the white rhinoceros was most excellent, the part in greatest favour amongst hunters being the hump on the back of the neck in front of the shoulder, which was cut off whole and roasted in the skin in a hole dug in the ground.

The colour of the so-called white rhinoceros is dark gray. The second species of African rhinoceros, which is also dark gray in colour, is known as the BLACK OR PREHENSILE-LIPPED RHINOCEROS.

Less than a hundred years ago the range of this fast-disappearing species extended from the northwestern districts of the Cape Colony to Abyssinia, and at that time it must have been plentiful over almost the whole of the intervening country. It never seems to have penetrated into the equatorial forest regions of West Central Africa, where the climate is probably too damp to suit its requirements; for both species of African rhinoceros appear to like a dry climate, and not to object to very arid surroundings. At the same time they never wander many miles from a river or pool, and drink regularly every night, and in hot weather probably very often a second time in the early morning.

In Southern Africa the black rhinoceros appears to attain to a larger size than in the countries farther north. To the south of the Zambesi large bulls of this species will stand 5 feet 8 inches at the shoulder; whilst the height of an adult bull, as taken by Mr. F. Jackson at Naivasha, in East Africa, was 5 feet 5 inches; and Mr. A. H. Neumann gives the standing height of another adult bull shot by himself still farther north, near Lake Rudolph, as only 4 feet 9 inches.

It is now generally recognised that there is but one species of prehensile-lipped rhinoceros in Africa, though the horns, and especially the hinder one, differ in length and shape to such an extent that it was long thought that there were at least two distinct species, those with both horns of equal or nearly equal length having been distinguished from the more common form, with a comparatively short second horn, as the KEITLOA, this being the name in the Sechuana dialect for a prehensile-lipped rhinoceros with horns of equal length. Speaking on this subject, Mr. A. H. Neumann, who has had great experience with the black rhinoceros in East Africa, writes: "Length of horn is a purely fortuitous individual trait; and the extremely long horns (mostly of females) which have occasionally been obtained from traders on the east coast, and brought home, are merely exceptionally fine specimens, selected from among large numbers brought to the coast (the bulk of which, I am told, go to China to be ground up into medicine), and do not belong to any distinct species, nor come from any particular region. In proof of this contention I may mention that I have a 40-inch horn, the owner of which I myself shot at the northern base of the Jambeni Range (near Kenia), in a neighbourhood where I hunted a great deal and saw great numbers of rhinos, and shot a good many. The vast majority have quite short horns—under a foot—and anything over 18 inches is uncommon, while a length of 30 inches or upwards is extremely rare." The black rhinoceros, I believe, never eats grass, but browses on the young shoots of trees and bushes, which are often quite leafless and seem excessively dry. In this way it chews up and swallows great quantities of dry-looking twigs, much of which passes through its stomach undigested.

Photo by Norman B. Smith, Esq.

BLACK AFRICAN RHINOCEROS

This photograph, taken by a sportsman in Africa, shows a charging rhinoceros just before it was shot

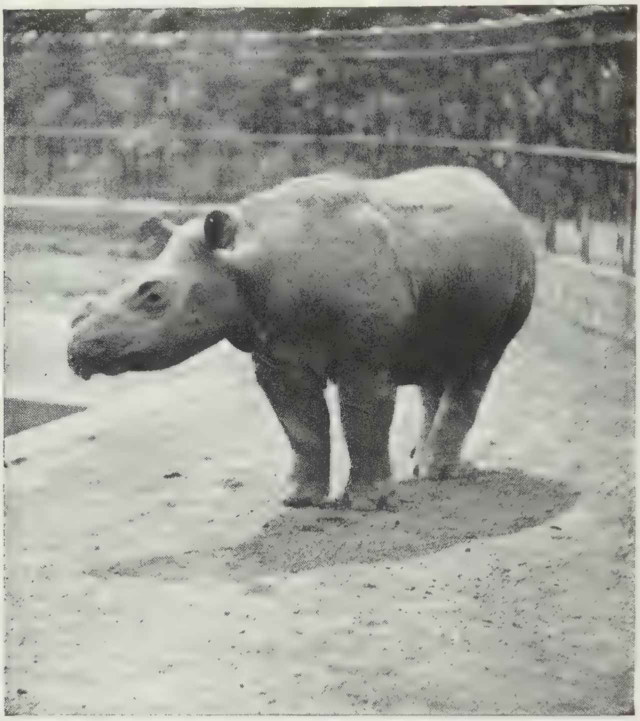


Photo by York & Son] [*Notting Hill*

SUMATRAN RHINOCEROS

This species of rhinoceros is the smallest of the three Oriental forms. It has two horns

There has been a good deal of controversy as to the character and disposition of the black rhinoceros, some hunters and travelers regarding it as most dangerous and aggressive, whilst others are inclined to take an almost opposite view. That some black rhinoceroses are certainly aggressive and therefore dangerous animals, the experiences of C. J. Anderson and W. Cotton Oswell in South Africa many years ago, and of many travelers and hunters in East Africa during the last few years, certainly prove beyond a doubt; and as one never knows that any particular rhinoceros, when encountered, may not prove to be a vicious brute, a certain amount of caution should be employed in approaching one of these animals. In my own experience I always found that black rhinoceroses ran off at once on getting the wind of a human being; whilst, on the other hand, if they only heard one approaching, they would come towards the noise, and I have often known them to trot up to within twenty yards of where I was standing, snorting and puffing loudly; but as these animals always turned round and went off eventually without charging, I came to the conclusion that they were inquisitive and very short-sighted rather than vicious. When fired into, a black rhinoceros goes off at a gallop—his usual pace, when alarmed, being a very fast trot—puffing and snorting loudly. He can gallop at a very great pace, considering his size and weight; but a South African shooting-pony can easily come up with him, or get away from him if pursued. In death a black rhinoceros will often sink down on its knees, and remain in that position, looking as if it were simply resting. When dying, it often gives vent to a pitiful squeal, the sound seeming very small and thin for so large a beast. The meat of the black rhinoceros is not ill-flavoured, and, if fat, very palatable; but as a rule these animals are very lean, and their flesh tough and coarse. The tongue, however, if well cooked, is always good; and the liver if first roasted under the ashes, and then, after being beaten up in a native wooden mortar, cooked with rice and fat, makes a dish which is good enough for a hungry man.

During the making of the Uganda Railway the engineers came upon something like a preserve of this species of rhinoceros, especially in the thick and waterless thorn jungle near the coast. The rhinoceros was almost the only animal, except the lion, which was able to penetrate the bush. As many as five of these animals were seen in one day when the line was being made; they did no injury to the coolies, other than by frightening them, and appeared to be stupid and by no means vigilant animals, perhaps because no other creature attacked them. The lion never meddles with a grown-up rhinoceros, though it might and probably does kill a calf occasionally, when the latter is no larger than a full-grown pig. The horns of some of these East African black rhinoceroses were of unusual length and thinness.

CHAPTER XII.

THE HORSE TRIBE.

ZEBRAS AND WILD ASSES.

BY F. C. SELOUS.

Zebras.

THE Zebras have many points in common with the asses, from which latter group of animals they are principally distinguished by their beautifully striped skins. Both asses and zebras carry short, erect manes, and in both the upper portion of the tail is free from long hair. In both groups there are naked callosities on the fore legs only, whilst the head is larger in proportion to the size of the animal, and the ears longer than in the horse. In Burchell's and Grevy's Zebras the hoof is intermediate between that of the horse and the ass ; for although narrower than the hoof of the horse, it is broader and more rounded than that of the ass. In the True Zebra, however, the hoof is thoroughly asinine in character, and the ears very long.

The True or Mountain Zebra appears never to have had a very extended range. It was once an inhabitant of all the mountainous regions of the Cape Colony as well as of the great Drakensberg Range, and fifty years ago was also found amongst the rugged hills of Great Namaqualand. The mountain-zebra is the smallest of the group, standing only from 12 to 12½ hands at the shoulder. It is a most beautiful animal, the whole of the head, body, and limbs, with the exception of the under-parts and the insides of the thighs, being striped. The ground-colour of the body is white, the stripes

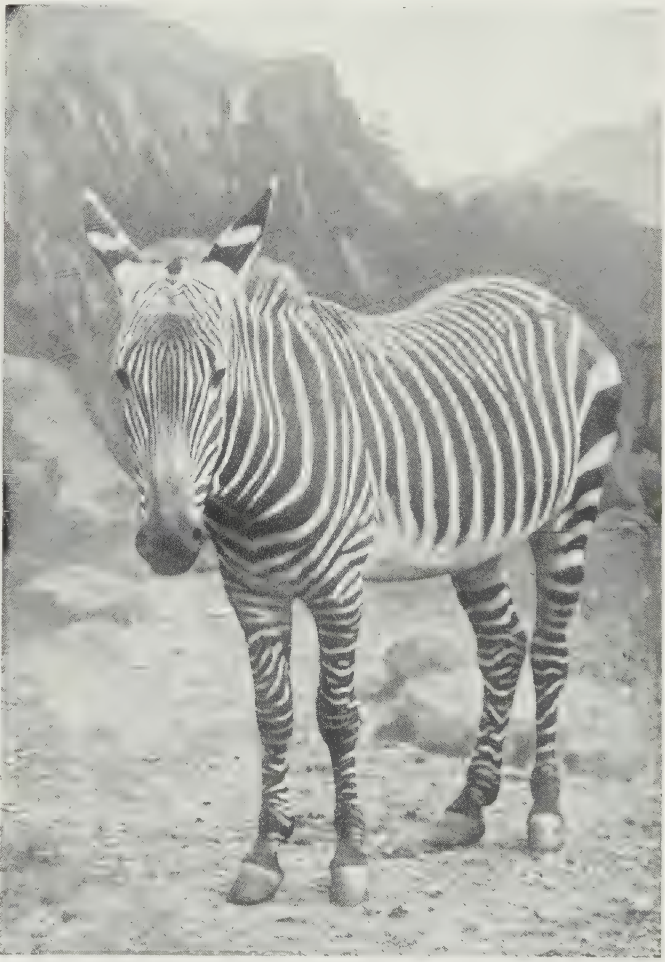


Photo by G. W. Wilson & Co., Ltd.

MOUNTAIN-ZEBRA

The true or mountain zebra is now becoming scarcer than formerly. At one time it was to be seen in great numbers on the mountains of Cape Colony

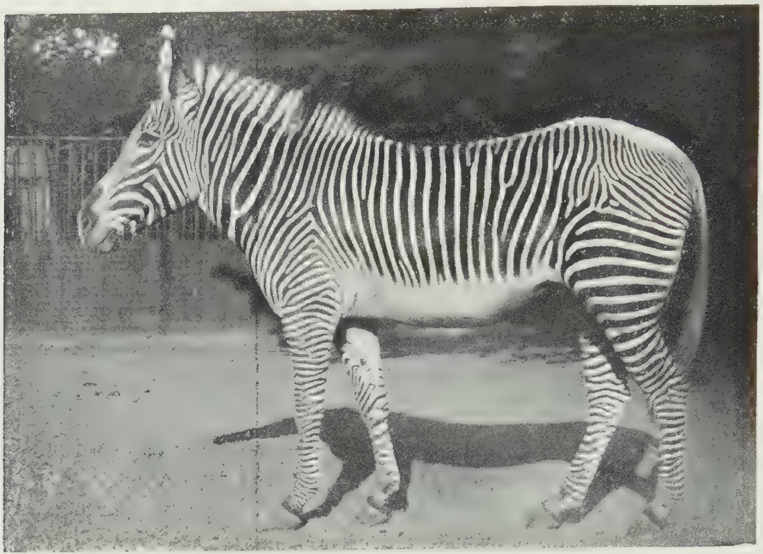


Photo by W. P. Dando

GREVY'S ZEBRA

This species of zebra come from the Galla country, and has narrower and more numerous stripes than the mountain-zebra

being black and the muzzle bright brown. Both hind and fore legs are banded down to the hoofs. The stripes on the neck and body are narrower and more numerous than in Burchell's zebra, and on the hindquarters the median stripe, which runs down the centre of the back from the mane to the tail, is connected with the uppermost of the oblique longitudinal stripes by a series of short horizontal bars. The ears in this species are much larger than in Burchell's zebra.

The true zebra seems never to have been an inhabitant of the plains, like all its congeners, but to have confined its range entirely to mountainous districts. Speaking on this point, Captain (afterwards Sir) Cornwallis Harris wrote upwards of sixty years ago: " This beautiful and wary animal never of its own free will descends into the plain, as erroneously asserted by all naturalists, and it therefore never herds with either of its congeners, the quagga and Burchell's zebra, whose habitat is equally limited to the open and level lowlands. Seeking the wildest and most sequestered spots, the haughty troops are exceedingly difficult of approach, as well on account of their watchful habits and extreme agility and fleetness of foot, as from the abrupt and inaccessible nature of their highland abode."

An allied species, of which examples have been obtained by Mr. G. W. Penrice, occurs in Benguela, Portuguese West Africa.

I once saw the carcase of a zebra stallion which had been sent by rail to the Cape Town Museum by a farmer living in the neighbourhood of the village of Worcester. This animal had come down from the mountains, and joined a troop of donkeys running on the farm. Its intrusion was, however, resented by a male donkey, which fought with and overpowered it, and, having seized it with its teeth by the back of the neck, held it fast until it was secured by the farmer and his men. The captured animal, however, refused food, and soon died, when its carcase was sent to the Cape Museum for preservation.

Grevy's Zebra is the largest and perhaps the handsomest of all the zebras. This fine animal is an inhabitant of Eastern Africa, its range extending from the central portion of Somaliland southwards to the Tana River. It appears to be plentiful in the country between Mount Kenia and Lake Rudolph, but has not, I believe, been met with to the west of that lake. Full-grown specimens of Grevy's zebra will stand from 14½ to 15 hands at the shoulder, with a girth of body immediately behind the shoulders of nearly 5 feet. The arrangement of the stripes in this species differs considerably both from that of the mountain-zebra of the Cape Colony and also from Burchell's zebra. The body-stripes are very narrow, numerous, and deep black in colour, and are separated by equally narrow white bands. The longitudinal stripes on the haunches are also shorter and finer than in any other species of zebra, and on the top of the centre of the back from the neck to the tail. The belly and insides of the thighs are white, and the legs banded right down to the hoofs as in the mountain-zebra, and the ears are as large as in that species.

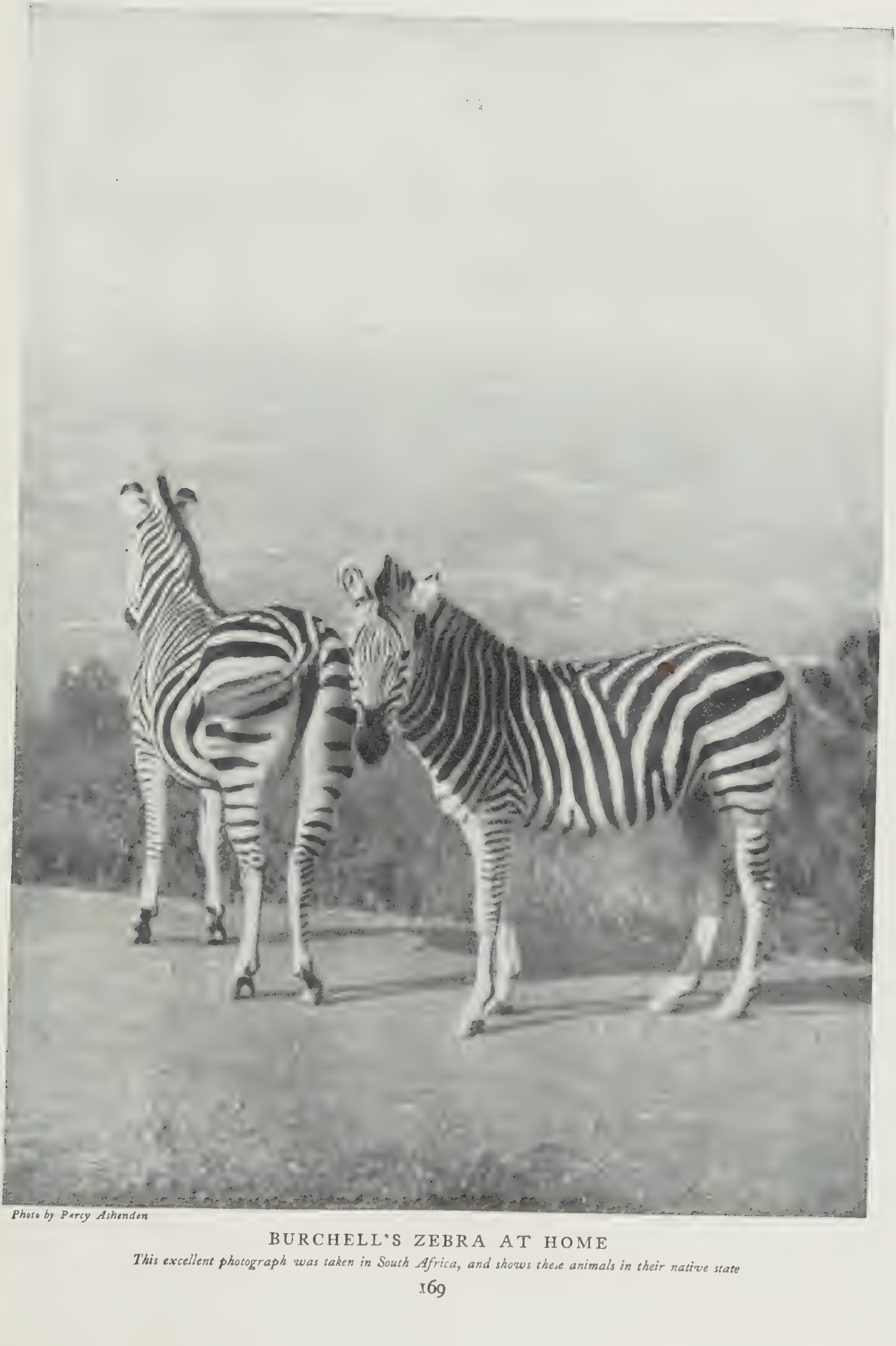


Photo by Percy Ashenden

BURCHELL'S ZEBRA AT HOME

This excellent photograph was taken in South Africa, and shows these animals in their native state

Grevy's zebra is, as a rule, an inhabitant of open or thinly wooded country, and it appears to avoid anything in the nature of thick cover. In Central Somaliland Major Swayne met with it on low plateaux some 2,500 feet above sea-level, the sides of which fell in broken ravines to the river-valleys. This country is described as broken and hilly, and here Grevy's zebras were met with in small droves of about half a dozen. In the country between Mount Kenia and Lake Rudolph, Mr. A. H. Neumann frequently met with herds of Grevy's and Burchell's zebras consorting together. The contrast between the two species when thus seen side by side was very marked, the former animals looking like horses among a flock of ponies. Mr. Neumann never observed stallions of the two species fighting together, but on the other hand he states that the stallions of the larger species fight viciously amongst themselves for possession of the mares. Grevy's zebras seem never to collect in large herds, more than twenty, or at the outside thirty, being very seldom seen together.

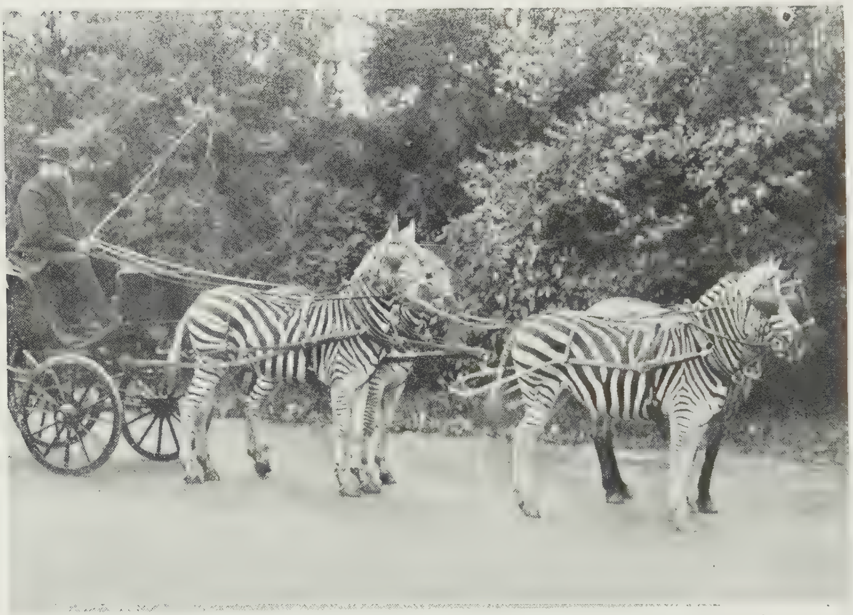


Photo by V. T. Newman, *[Berkhamsted*

THE HON. WALTER ROTHSCHILD'S TEAM OF ZEBRAS

Mr. Rothschild was practically the first person to break in zebras to harness. At one time these animals were thought to be quite untamable

Although this species is an inhabitant of arid plains and bare stony hills where the herbage is short, it requires to drink daily, and is never therefore found at any great distance from water.

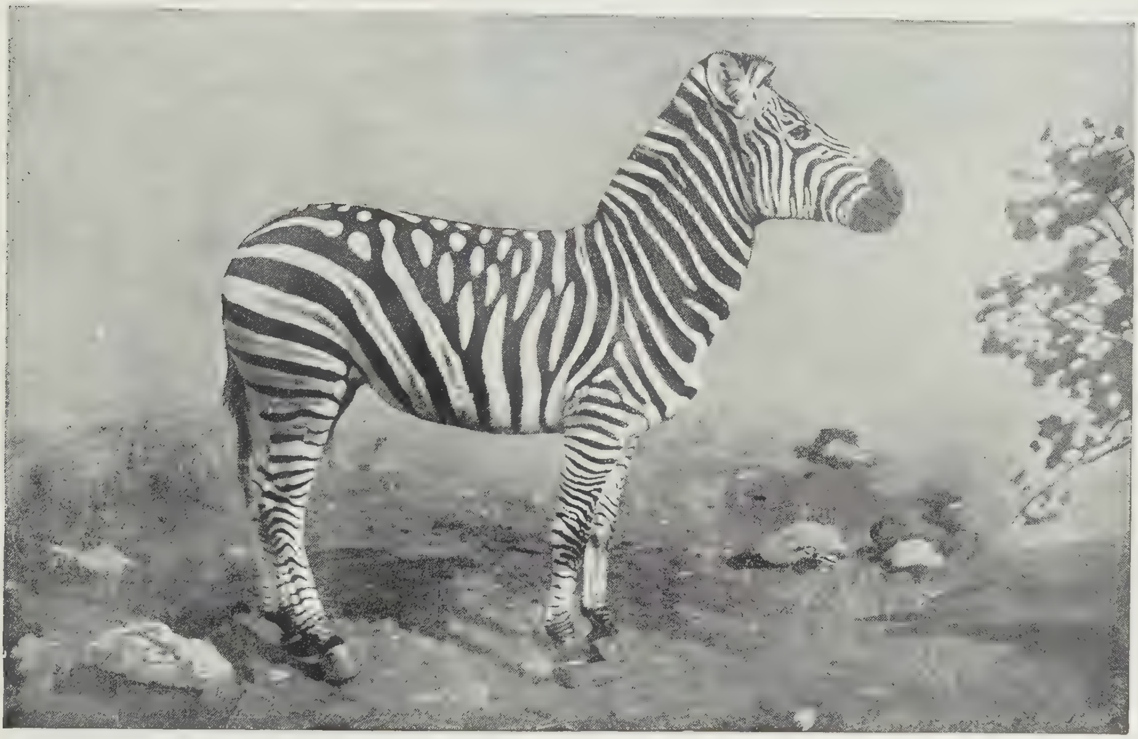
The cry of Grevy's zebra is stated to be quite different from that of Burchell's. Mr. Neumann describes it as a very hoarse kind of grunt, varied by something approaching to a whistle, the grunts being long drawn out, and divided by the shrill whistling sound, as if the latter were made by drawing in the breath which had been expelled during the sustained grunt.

Like all other species of the genus to which they belong, Grevy's zebras, especially the mares when in foal, become very fat at certain seasons of the year, and their flesh is much appreciated both by natives and lions, the latter preying on them and their smaller congeners, Burchell's zebras, in preference to any other animal, now that the rinderpest has almost exterminated the great herds of buffalo which once roamed in countless numbers all over East Central Africa.

Burchell's Zebra once inhabited the whole of Southwestern, Southeastern, Central, and Eastern Africa from the Orange River to Lake Rudolph; and though it has long ceased to exist in the more southerly portions of its range, it is still the most numerous and the best known of all the species of zebra.

The typical form of this species was first met with early last century by Dr. Burchell in Southern Bechuanaland. In this form the legs are white below the knees and hocks, and the body-stripes do not join the median stripe of the belly. In examples met with farther north the legs are striped down to the hoofs and the body-stripes join the belly-stripe. South of the Zambesi all forms of Burchell's zebra seem to have faint markings, known as shadow-stripes, on the pale yellow ground-colour of the spaces between the broad black stripes. North of the Zambesi varieties are met with in which these shadow-stripes are wanting. As, however, the differences between all the various sub-species of Burchell's zebra are superficial and not structural, and as, moreover, the habits of these animals seem to be the same in every part of their widely extended range, I shall henceforth speak of them as one species.

Burchell's zebra is without the small horizontal bars on the hindquarters, which in the mountain-zebra connect the dorsal stripe with the uppermost of the broad longitudinal bands running across the flanks. Its ears, too, are smaller than in the latter species, and its mane fuller. In size Burchell's zebra is intermediate between the mountain-zebra and Grevy's zebra, standing from thirteen to thirteen and a half hands at the shoulder.



By permission of Mr. William Cross

BURCHELL'S ZEBRA, CHAPMAN'S VARIETY

Where they have not been shot down, Burchell's zebras often live in large herds of from fifty to over a hundred together. I have met with them almost at the level of the sea, as in the Pungwe district of South-east Africa, and all over the high plateaux of the interior up to a height of 5,000 feet above sea-level. They are partial to sparsely forested country intersected by open glades, but also frequent open plains entirely devoid of trees or bush, having been once numerous on the open downs of the Western Transvaal and Orange River Colony. They never live in dense jungle, but I have met with them frequently amongst broken rugged hills. Burchell's zebras are both fleet and enduring, but I have often galloped right amongst a herd of them when mounted on a fast horse, and in good ground. In broken, hilly, and stony ground, however, no horse can live with a Burchell's zebra. The hoofs of this species seem made for running in rocky ground, being deeply hollowed and as hard as iron.

I have always found the presence of Burchell's zebras a sure indication that water was not

MARE AND FOAL OF BURCHELL'S ZEBRA

These animals breed regularly in captivity

far distant, and it is my experience that these animals require to drink daily, and never wander more than a few miles away from the pool or river they frequent.

This species of zebra may often be seen in Southern Africa in company with other animals, such as buffaloes, blue wildebeests, elands, gemsbucks, roan and sassaby antelopes, and ostriches, and I have upon several occasions seen them come up to domestic cattle and horses. They are naturally not very wary, and in parts of the country where they have not been much molested are often very inquisitive, and will come trotting quite close up to a caravan, provided they do not get the scent of human beings. Foals of this species are easily caught, and become at once very tame and confiding; nor do I believe that adult Burchell's zebras are such vicious animals as is generally supposed, since I have seen several which were very quiet and well broken, whilst even the half-broken animals, which were at one time used on one of the coach-lines in the Transvaal, did not appear very vicious.

As with Grevy's zebra, the flesh of the species under consideration is much appreciated both by natives and lions. I have often seen the fat on the quarters of the mares quite an inch thick. It is of a dark yellow colour, and too rich to suit the stomach of a European The meat is rather sweet in taste, but if fried with bacon not at all unpalatable.

Professor Ewart has lately carried out a very interesting series of experiments on the hybridising of zebras and horses. The results were very satisfactory. The zebra cross proved to be very hardy creatures, capable of wintering in the open on the hills of Scotland. The scientific data obtained were of singular value, as showing the effect of crossbreeding on subsequent generations of foals of the same mother. It has long been believed that the influence of the first sire was seen in foals of which other animals were subsequently the fathers. Thus, if a white mare threw a foal to a black stallion, it was considered that her subsequent progeny would occasionally be black, and instances were freely quoted to support this theory. The scientific name of "telegony" was given to this supposed influence of previous sires on future offspring. Professor Ewart's experiments, in which pony mares were first mated with a zebra and afterwards with horses, show that this theory of telegony is erroneous. The foals sired afterwards by ponies and horses showed no trace whatever of zebra stripes, but were normal pony foals, and not altered either in shape or disposition.

Photo by Norman B. Smith, Esq.

BURCHELL'S ZEBRA

This species is occasionally domesticated and driven in South Africa. as it is not injured by the tsetse fly

Photo by Percy Ashenden

ZEBRAS ON TABLE MOUNTAIN

Another South African photograph. Notice Cape Town in the far distance

The QUAGGA, which became extinct about thirty years ago, never had a very extended range, but in the early part of the last century it existed in great numbers on all the upland plains of the Cape Colony to the west of the Kei River, and in the open treeless country lying between the Orange and Vaal Rivers. North of the Vaal it appears to have been unknown.

The quagga seems to have been nearly allied to Burchell's zebra — especially to the most southerly form of that species — but was much darker in general colour, being of a dark rufous brown on the neck and upper-parts of the body, becoming lighter on the sides, and fading off to white beneath and behind. Instead of being striped, too, over the whole body, it was only strongly banded on the head and neck, the dark brown stripes becoming fainter on the shoulders and dying away in spots and blotches. On the other hand, in size and build, in the appearance of its mane, ears, and tail, and in general habits, it seems to have nearly resembled its handsomer relative. The barking neigh "quā-hā-hā, quā-hā-hā" seems, too, to have been the same in both species. The word "quagga" is pronounced in South Africa "quā-hā," and is of Hottentot origin, being an imitation of the animal's neighing call. To-day Burchell's zebras are invariably called Quā-hās by both Boers and British colonists.

WILD ASSES

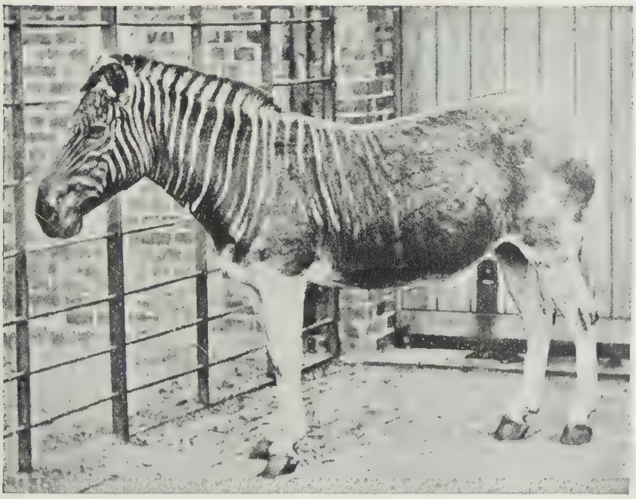


Photo by York & Son

QUAGGA

This is, we believe, the only known photograph from life of this very rare animal. There will probably never be another, for the quagga is generally supposed to be extinct

The true asses are without stripes on the head, neck, and body, with the exception of a dark streak down the back from the mane to the tail, which is present in all members of the group, and in some cases a dark band across the shoulders and irregular markings on the legs.

In Africa the wild ass is only found in the desert regions of the north-eastern portion of that continent, being an inhabitant of Abyssinia, Somaliland, Gallaland, the Soudan, and the arid districts bordering the Red Sea. The form of wild ass found in Somaliland differs in some respects from its near relative of the Nubian Desert, in that it is of a paler colour, has the dorsal stripe but faintly marked, and is without a cross stripe over the shoulders, whilst on the other hand it has numerous markings both on the front and hind legs. Naturalists are, however, agreed that, although there may be certain small differences in the colour and markings of the wild asses found in different localities of Northern Africa, such variations are of no specific value, and only one species is recognised.

The African Wild Ass is a fine animal, standing between 13 and 14 hands at the shoulder. It lives in small herds or families of four or five individuals, and is not found in mountainous districts, but frequents low stony hills and arid desert-wastes. It is as a general rule an alert animal and difficult to approach, and so fleet and enduring that, excepting in the case of foals and mares heavy in young, it cannot be overtaken even by a well-mounted horseman. Notwithstanding the scanty nature of the herbage in the districts they frequent, these desert-bred asses are always in good condition. They travel long distances to water at night, but appear to require to drink regularly. Their flesh is eaten by the natives of the Soudan. The bray of the African wild ass is said to be indistinguishable from that of the domesticated animal, which latter is undoubtedly descended from the wild African breed.

In Asia three varieties of the wild ass are found, which were formerly believed to represent three distinct species; but since the points of difference between these varying forms do not appear to be of specific value, all the local races of the Asiatic wild ass are now considered to belong to one species.

These wild asses have a wide range, and are met with in the deserts of Asia from Syria to Persia and Western India, and northwards throughout the more arid portions of Central Asia.

In Tibet and Mongolia the wild ass inhabits the high mountain-plateaux, and lives at elevations of 14,000 feet and upwards above the sea. This local race, know as the Kiang, approaches in size to the African wild ass, standing 13 hands at the shoulder. It is dark reddish brown in colour, with a very narrow dorsal stripe. The Onager of Western India and Baluchistan is a smaller and lighter-coloured animal, with a broader stripe down the back. In parts of its range it is found at sea-level. In Persia and Syria a third local race of wild ass is found, which, however, differs from the two forms already enumerated in no essential particular.

Like their African congeners, the wild asses of Asia are inhabitants of the waste places of the earth, frequenting desert plains and wind-swept steppes. They are said to be so fleet and enduring that, except in the case of a mare heavy with foal, they cannot be overtaken by a single horseman.

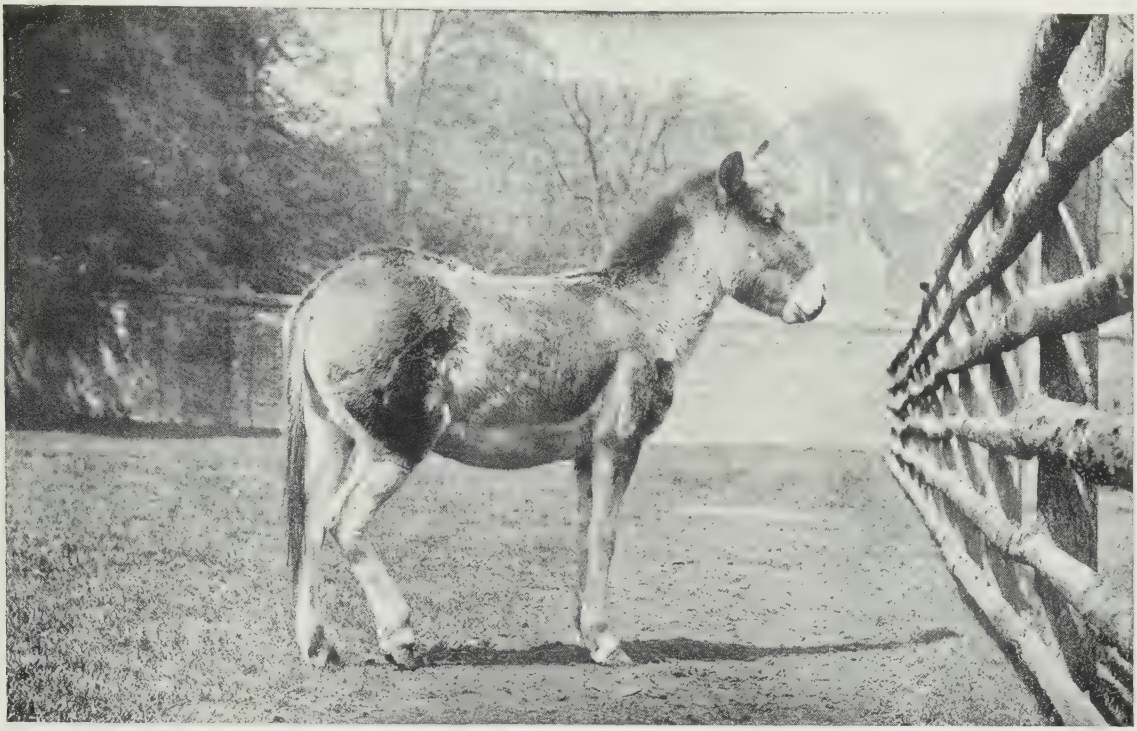
Photo by J. W. McLellan

BALUCHI WILD ASS

This is one of the three leading varieties of the Asiatic wild ass. It is found in Western India and Baluchistan

The wild asses of the desert plains of India and Persia are said to be very wary and difficult to approach, but the kiang of Tibet is always spoken of as a much more confiding animal, its curiosity being so great that it will frequently approach to within a short distance of any unfamiliar object, such as a sportsman engaged in stalking other game.

Asiatic wild asses usually live in small families of four or five, but sometimes congregate in herds. Their food consists of various grasses in the low-lying portions of their



MALE KIANG

The kiang comes from the Tibetan highlands. It is the largest and most horse-like of the wild asses of Asia

range, but of woody plants on the high mountain-plateaux, where little else is to be obtained. Of wild asses in general the late Sir Samuel Baker once said: "Those who have seen donkeys only in their civilised state can have no conception of the wild or original animal; it is the perfection of activity and courage."

DOMESTICATED HORSE, ASSES, AND MULES

BY W. P. PYCRAFT, A.L.S., F.Z.S

THE DOMESTICATED HORSE

LIKE the wild camels, genuine wild horses are very generally believed to be extinct. The vast herds which occur to-day in a wild state in Europe, America, and Australia are to be regarded, say those who believe in the extinction theory, as descended from domesticated animals which have run wild. So far as the American and Australian horses are concerned, this is no doubt true; but of the European stocks it is by no means so certain. For Dr. Nehring—and he speaks with authority—assures us that the wild horses known as TARPANS, which occur on the steppes north of the Sea of Azoff, between the river Dnieper and the Caspian, are veritable wild horses, the last remaining members of enormous herds which occurred in Europe before the dawn of civilisation. These horses formed no small part of the food of the savage races of men then inhabiting this continent. This we know because of the quantities of their remains found in the caves of the south of France, for instance, associated with the remains of the men who hunted them. Further evidence of this we have in the shape of crude engravings on pieces of bone and deer horns, carved by the more artistic spirits amongst these early hunters. From these drawings we gather that the horse they hunted was small in size and heavy in build, with a large head and rough, shaggy mane and tail — a horse, in fact, almost identical with the above-mentioned tarpan. But long before historic records begin these horses must have been domesticated; man discovered that they could be even more useful alive than dead, and from that time forth the horse became his inseparable companion. "Cæsar found the Ancient Britons and Germans using war-chariots drawn by horses."

But the stock of domestic horses drawn from this tarpan breed appears to have died out almost entirely, the majority of horses now existing being probably descendants of the native wild horses of Asia, the product of a still earlier domestication. In Egypt the horse, as a domestic animal, seems to have been preceded by the ass; but about 1900 B.C. it begins to appear in the rôle of a war-horse, to draw chariots. Its use, indeed, until the Middle Ages was almost universally as a war-horse.

From the time of its domestication till to-day the history of the horse has been one of progress. The care and forethought of the breeder have produced many varieties, resulting in such extremes as the London Dray-horse, the Racer, and the Shetland Pony.

The coloration of our various breeds of horses is generally without any definite marking, piebald and dappled being the nearest approach to a pattern. Occasionally, however, horses are found with a dark stripe along the back, and sometimes with dark stripes on the shoulders and legs. Darwin, discovering a number of horses so marked belonging to different breeds, came to the conclusion that probably all existing races of horses were descended from a "single dun-coloured, more or less striped primitive stock, to which [stock] our horses occasionally revert."

Photo by T. Fall

YEARLING ARAB COLTS

Note the colts examining the photographer's bag. They are very inquisitive creatures, but easily frightened

"If we were not so habituated to the sight of the horse," says the late Sir William Flower, "as hardly ever to consider its structure, we should greatly marvel at being told of a mammal so strangely constructed that it had but a single toe on each extremity, on the end of the nail of which it walked or galloped. Such a conformation is without parallel in the vertebrate series." By the aid of fossils we can trace out all the stages through which this wonderful foot has passed in arriving at its present state of perfection: we can see how it has become more and more beautifully adapted to fulfil the requirement demanded — a firm support to enable its owner to cover hard ground at great speed. The study of the structure of this foot, and a comparison with the intermediate forms, make it clear that this toe corresponds to the third finger or toe of the human hand or foot — according as we compare the fore or hind limbs — and that its development was at the expense of the remaining toes, which gradually dwindled and disappeared, leaving in the living one-toed horse only traces of the second and fourth toes in the shape of a pair of splint-bones, one on either side of the excessively developed third toe.

The horses, it must be remarked, may be distinguished from the asses by the fact that the tail in the former is clothed with long hair throughout; in the latter long hair springs only from the sides and end, forming a tuft. Furthermore, the horses have a remarkable horny

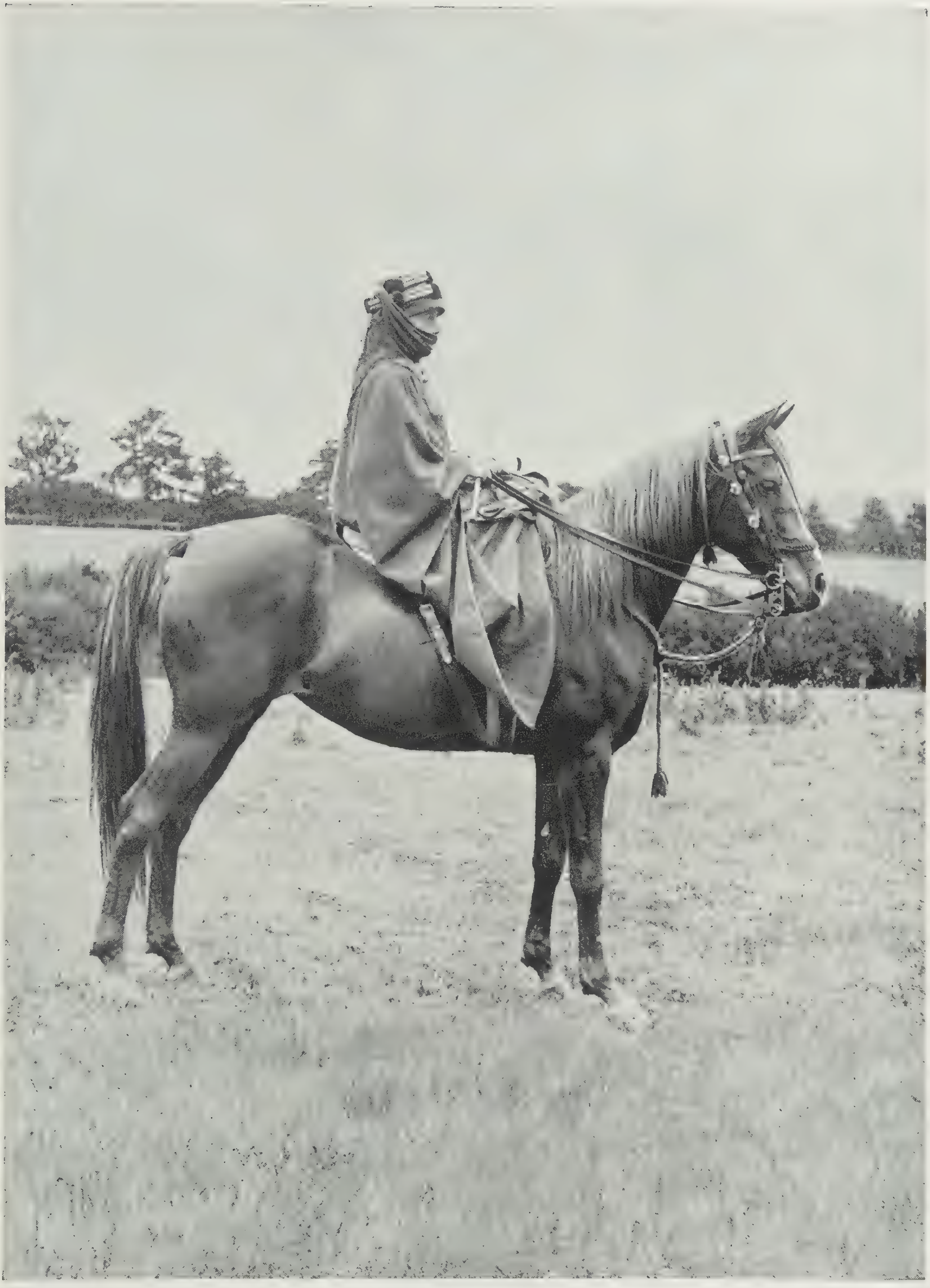


Photo by [illegible]

ARAB MARE

Nothing would induce this horse to stand still in order to be photographed; so as a last resource the rider put on her Arab costume. This acted like magic, for under its spell the animal at once became quiet

Photo by T. Fall

ARAB MARES AND FOALS

excrescence, resembling a huge black and flattened wart, on each hind leg just below the "hock," or heel-joint. This excrescence is commonly known as the "chestnut." Its function is unknown. A similar pair of "chestnuts" occurs on the inner side of the fore limb just above the wrist, or "knee," as it is generally called. The "chestnuts" of the fore limb occur also in the asses, but not those of the hind limb.

The Arab Horse

This magnificent and justly celebrated animal is chosen first for consideration because it is probably a direct descendant of an original wild breed — the Asiatic wild horse. How far back the domestication of this breed began will probably never be exactly known. Till the third century after Christ the Arabs were almost certainly camel-riders; but by the sixth century of our era we find them in possession of a breed of horses which they regarded with great reverence, and spoke of as an heritage from their forefathers. They were probably introduced from the Caucasus or Asia Minor. The Arab horse found its way into Europe, perhaps accompanied by an allied breed — the Barb — with the Arab invasion of Spain in the eighth and ninth centuries, leaving traces of its sojourn in the Andalusian and the French Limousin. But the great value of Arab blood was not appreciated till armour ceased to be used, the excessive weight of this demanding a horse of heavy build.

The Arab does not appear to have been introduced into England till the seventeenth century; but the result of that introduction, as we shall see presently, has been fraught with tremendous consequences. In its native land it appears to have been bred chiefly for the purposes of warfare. The success with which the breeders' judicious selection has been rewarded is plainly seen in the wonderful powers of endurance on long marches; so that, at the end of a raid, the animal is still fresh enough either for flight, if necessary, or for a final rush on a retreating enemy. Besides, Arabs possess great courage, and are frugal both in the matter of food and drink.

As a race-horse, one enthusiast assures us, the Arab is superior to every other natural breed; he is beaten only by his own half-breed offspring — the English Race-horse. But this seems to be rather an over-estimate.

The colour of the Arab varies; white is the most highly esteemed, but bay and chestnut are common, black being rare. Strange as it may seem, the white breed is never born white.

The great affection of the Arab for his horse is proverbial. The following story is certainly worth repeating: "The whole stock of an Arab of the desert consisted of a mare. The French Consul offered to purchase her, in order to send her to his sovereign, Louis XIV. The Arab would have rejected the proposal; but being miserably poor, with scarcely a rag to cover him, his wife and children starving, he was tempted greatly. At length he yielded. He brought the mare to the consul's house, and stood leaning on her neck, and looking, now at the gold, and now at the horse. The gold was good to look upon; it would make him rich for life. Turning at last to his favourite, he said: 'To whom is it I am going to yield thee up? To Europeans, who will tie thee close, who will beat thee, who will make thee miserable. Return with me, my beauty, my jewel, and rejoice the hearts of my children.' At the last of these words he sprang upon her back, and was in a few moments out of sight."

PERCHERON HORSE

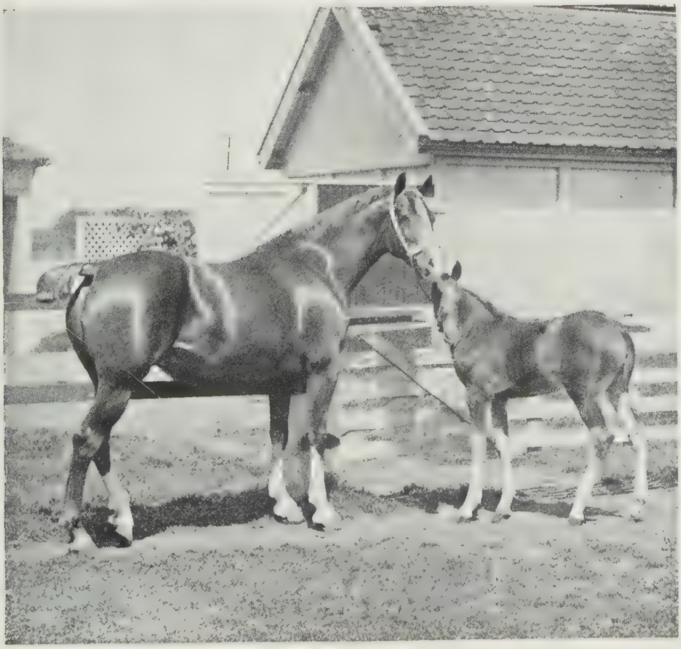


Photo by T. Fall

HACKNEY AND FOAL

A specimen of the English carriage-horse

THE BARB

This is an African breed, which, like the generality of African horses, is distinguished from those of Asia by its long limbs and small girth at the loins, thus resembling the foals of other breeds. It displays great powers of enduring hunger and thirst; and is fleet, with a high and graceful action. The barb takes its name from its native land — Barbary. It is a larger breed than the Arab.

Levant and Persian Horses

These are very closely allied to the Arab, but generally of larger size; and in Southern Persia, at least, less delicately framed. The Turkoman horses are related to those of Northern Persia.

The English Race-horse

This animal is the product of very careful selection and gradual improvement of an original native breed, extending over several centuries. Long since, so long ago as the reign of James I., it had reached a high degree of excellence.

Upon this native stock there has been built up, by the infusion of Arab blood, the swiftest horse which the world has ever known — the British Thoroughbred. "Of this breed, it may be stated," says Mr. Allison, "that every such animal in the stud-book of the present day, in this country or any other, descends . . . from one of three original Eastern sires — the Darley Arabian, the Byerley Turk, or the Godolphin Arabian." This is an extremely interesting fact, and constitutes a lasting monument to the enterprise and acumen of the British horse-breeder.

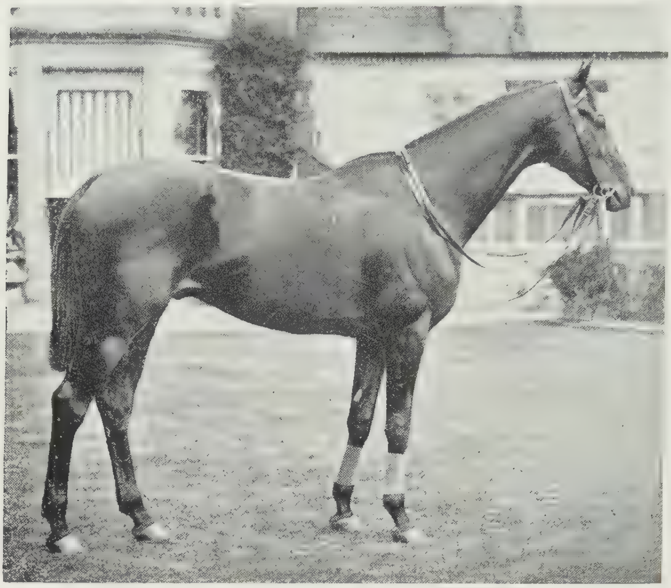


Photo by C. Reid

LADAS

A perfect English thoroughbred. With this racer Lord Rosebery won the Derby in 1894

The Byerley Turk hailed from the Levant, and was introduced by Captain Byerley about 1689. From the Byerley Turk came Herod, the most celebrated of his descendants, who has given rise to the Herod line, which to-day is but feebly represented.

The Godolphin Arabian, or the Godolphin Barb, was born about 1724. From his grandson Matchem is derived the Matchem line, which is also to-day bordering on extinction.

The Darley Arabian carries us back to the reign of Queen Anne. Flying Childers and Bartlett's Childers are directly descended from him; and from the latter is descended Eclipse, the fastest horse which the turf has ever known. It is interesting to note that the descendants in the Eclipse line enormously outnumber those of the other two lines which we have considered. Of his descendants, one of the

Photo by C. Reid

FLORIZEL II

One of King Edward's racing-stud

most illustrious is Stockwell, who has been described as the most extraordinary sire of all time, whose blood is coming more than ever to the front.

THE TROTTING-HORSE

This is an American breed. The trotting-horse is a combination of barb and Arab on an English stock. Most of the trotting- and pacing-horses of America may be traced to an English thoroughbred — Messenger — who was imported into America in 1780. This horse became the founder of the greatest trotting family in the world. The speed attained by some of the fastest trotters is wonderful, a mile being covered in some three or four seconds over two minutes.

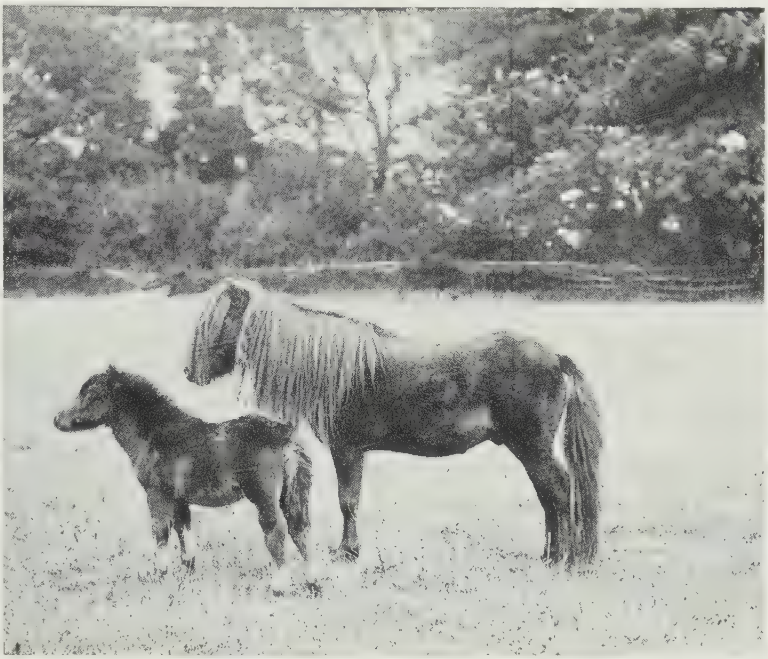


Photo by T. Fall

SHETLAND PONY AND FOAL

Russia is the only European country with a distinct breed of trotter — the ORLOFF. This breed was made by crossing Arab and English horses with the native races. The Orloff has not the speed of the American horse, but has greater powers of endurance. The trotting-season in Russia is winter, the races taking place on the ice.

The PACER is not a distinct breed, but so called on account of its curious method of trotting. In trotting the left fore and right hind leg strike the ground at the same moment; in pacing the fore and hind leg of the *same side* move in unison. Some wild animals — as the giraffe — are pacers. "Many American horses," says Mr. Winans, "are able to move with either action, a set of lighter shoes often sufficing to convert a trotter into a pacer." Pacing is a swifter mode of motion than trotting.

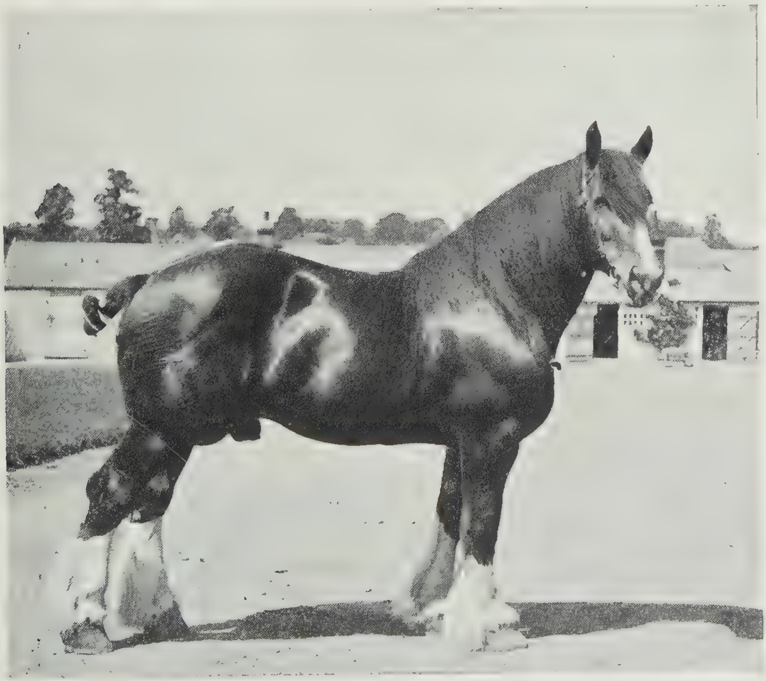


Photo by T. Fall

CHAMPION SHIRE STALLION

A celebrated cart horse

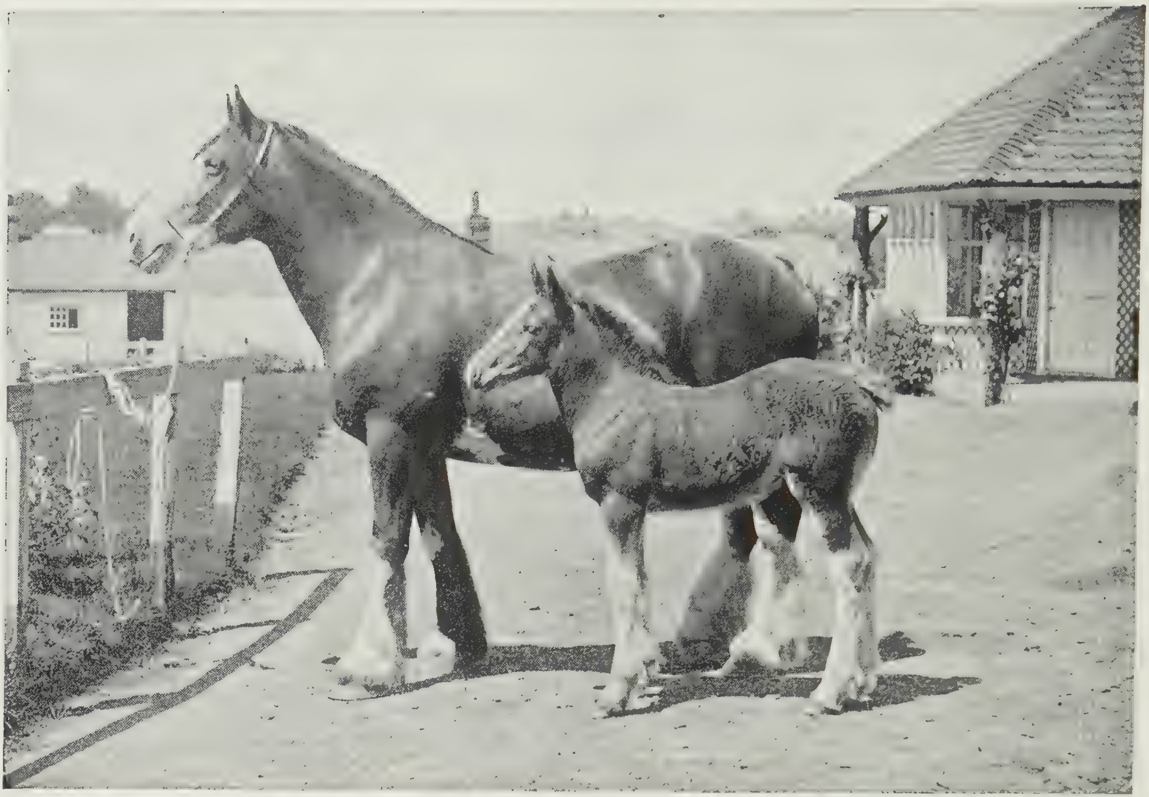


Photo by T. Fall

SHIRE MARE AND FOAL

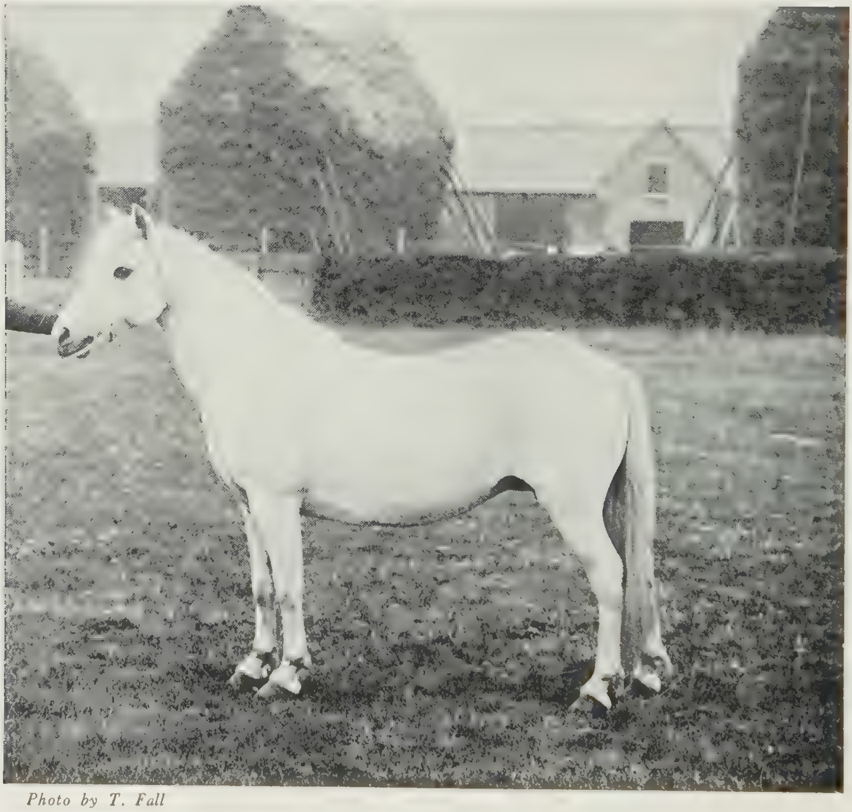


Photo by T. Fall

WELSH PONY

The pacing record time stands at one mile in 1 minute 59½ seconds, as against the trotting record of one mile in 2 minutes 3¾ seconds.

THE HUNTER

This also is not a distinct breed, as some suppose. Any good riding-horse may be used as a hunter. "Hunters" have been made by infusing the blood of the race-horse with native breeds. The chief requirements are a muscular neck and chest, with a rather short body, and shorter and stouter legs than the race-horse.

From the half-bred hunter we pass by insensible gradation to the ordinary saddle- and carriage-horses. The ideal carriage-horse, however, is more of a distinct breed than the hunter, and known as the CLEVELAND BAY. It has been produced by mingling the blood of the thoroughbred with that of a horse of stouter make than that of the hunter type.

The record broad jump for the hunter, we might mention in passing, is variously stated to be from 33 to 37 feet!

Photo by C. Reid

POLO-PONY

Various breeds of ponies are used in this game, but the most esteemed at the present day are the English-bred New Forest, Dartmoor, or Exmoor, or Welsh ponies.

THE SHETLAND PONY

This is a native of the Shetland Islands, and remarkable for its small size, docility, and hardihood. It is allowed to run nearly wild, and made to forage almost entirely for itself. In the winter it grows a coat of great length, which, soon becoming matted, forms a most effective protection against cold and wet. The DARTMOOR, EXMOOR, and NEW FOREST are likewise small breeds, but lack the symmetry and beauty of the Shetland.

CART-HORSES

Under this head are included all the large, heavily built draught-horses. These are of European origin, and without intermixture of foreign — Asiatic or African — blood. In England the most important breeds are the BLACK or SHIRE HORSE, the CLYDESDALE, and the SUFFOLK PUNCH. These are wonderful instances of the results of selective breeding

Photo by T. Fall

DONKEY

A Typical Coster's Donkey

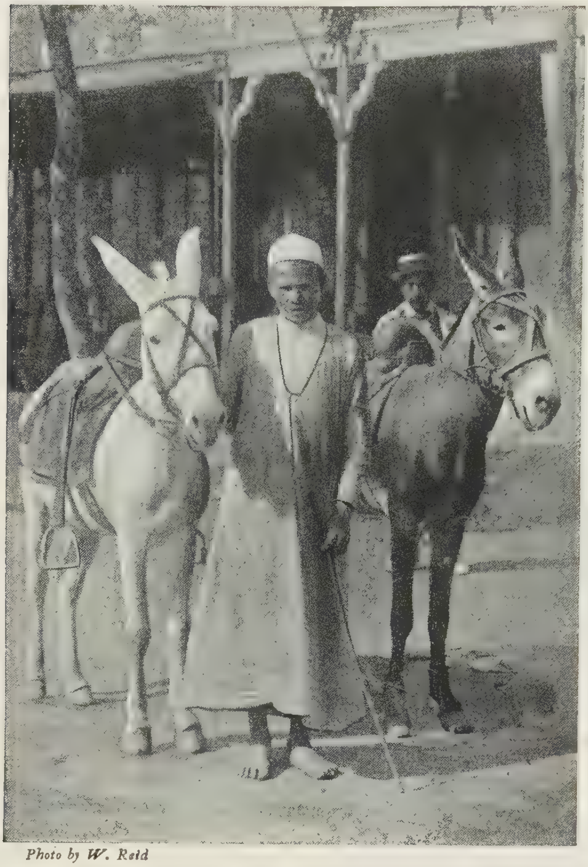


Photo by W. Reid

EGYPTIAN DONKEYS

The ass has long been known to the Egyptians, having been in use by them before the introduction of the horse

towards a definite end — large size, accompanied by great physical strength and powers of endurance. To accomplish this, speed has had to be sacrificed.

ASSES AND MULES

Asses

The Domestic Ass, so common to-day in these islands, is of African origin, and has, moreover, departed but little in either form or colour from the wild race. This is probably due to the fact that the ass has not been subjected in this country to that process of rigorous and careful selection that the horse has undergone.

We have no record of its first introduction to England, but it was certainly known in the reign of Ethelred, though it was a rare animal. Later it appears to have died out, and to have been reintroduced in the reign of Elizabeth; but it has never become popular. This is unfortunate; its sterling qualities have never been really appreciated there. Spain, Italy, and Malta have all succeeded in raising some fine breeds. The United States has, however, produced the finest of all in animals standing some 15 or 16 hands (5 feet or 5 feet 4 inches) high.

Mules

The term Mule, strictly speaking, should be reserved for the offspring of the male ass and the mare: the offspring of the opposite cross is called the Hinny. Mules are valued on account of their great powers of endurance and their sure-footedness. The finest and handsomest are bred in Spain, the United States, and North-west India.

It is interesting to note that mules exhibit a strong tendency to revert to the dun-coloured and striped coloration believed to belong to the primitive horses. The spinal and shoulder stripes which sometimes appear in horses, and more frequently in asses, occur yet more frequently in mules. The legs of the mules appear particularly liable to revert to this striped coloration in the United States, it is said nine out of ten being so marked.

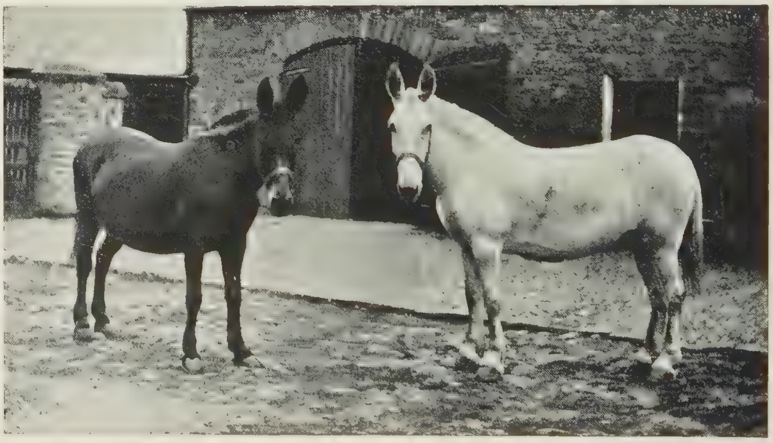


Photo by C. Reid] [Wishaw, N. B.

MULES

CHAPTER XIII

THE HOLLOW HORNED RUMINANTS: OXEN, BISON BUFFALOES, AND MUSK-OX

CATTLE, Deer, Camels, Pigs, Horses, Tapirs, Rhinoceroses, and Elephants differ greatly in structure from the orders already described. They are classed as the Ungulates, or Hoofed Mammals. In most of these, such as the Horse, Deer, and Oxen, the toes are contained within a solid hoof; in others, such as the Rhinoceros, they are protected by broad nails. Great differences exist in the feet of the various groups of Ungulates, caused by the degree in which the digits, or "toes," remain in use or not. Except in the Elephant, where there are five, the greatest number of "working" digits found in existing forms is four. In the Horse and its surviving allies the digits are reduced to one; in the Giraffes, to two.

The general process, as it can be learnt from the remains of the horse-like animals of the past, seems to have been as follows. One or more of the toes were developed in length and strength at the expense of the others, until, in the case of the Horse, only one toe remained, which was enclosed in a large and solid hoof, little splints on either side of the cannon-bone being left to hint where the second and fourth toes had once been. In the Oxen and Deer the third and fourth toes developed equally, at the expense of the others, and each gained a case or covering, which makes the two parts of the "cloven hoof" of these groups.

The first group of the order of Ungulates is represented by the Hollow-horned Ruminants. These have horns set on a core of bone, the horns themselves being hollow throughout. They "chew the cud," after receiving the food eaten into the first of four divisions in the stomach, whence it is brought up into the mouth, and then swallowed again for digestion. The Oxen, Sheep, and Goats have no popular name by which they are collectively distinguished, but their characteristics are sufficiently well known. The horns are never shed annually, as is the case with the Deer; and the hoofs are cloven. They have no incisor teeth in the upper jaw, a characteristic also shared by the Giraffes, the Prongbuck (or American antelope), and the Deer. The lower jaw has its full complement of incisor teeth.

The Oxen and the allied Bison, Yak, and Buffaloes are the bulkiest and most important to man of all ruminants. Some are found in nearly all inhabited parts of the Old World, and there is one North American species, now practically exterminated as a wild animal.

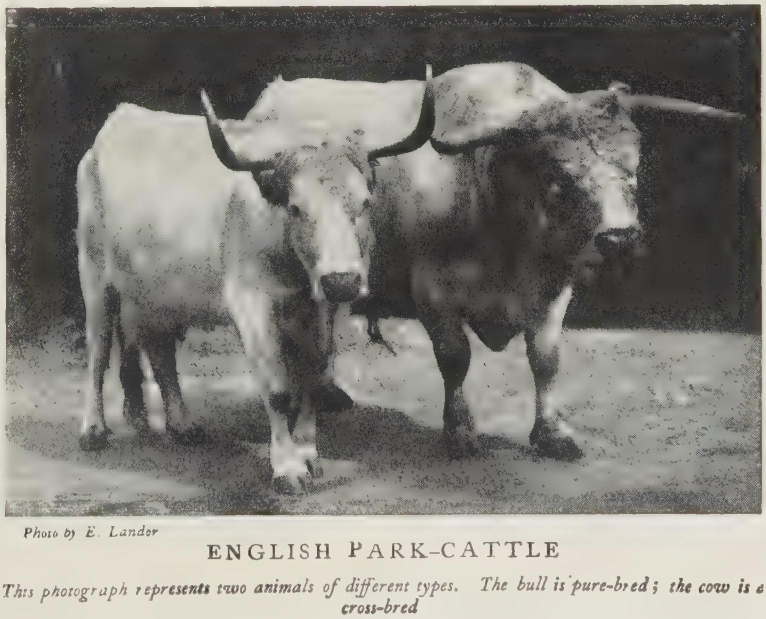


Photo by E. Landor

ENGLISH PARK-CATTLE

This photograph represents two animals of different types. The bull is pure-bred; the cow is a cross-bred

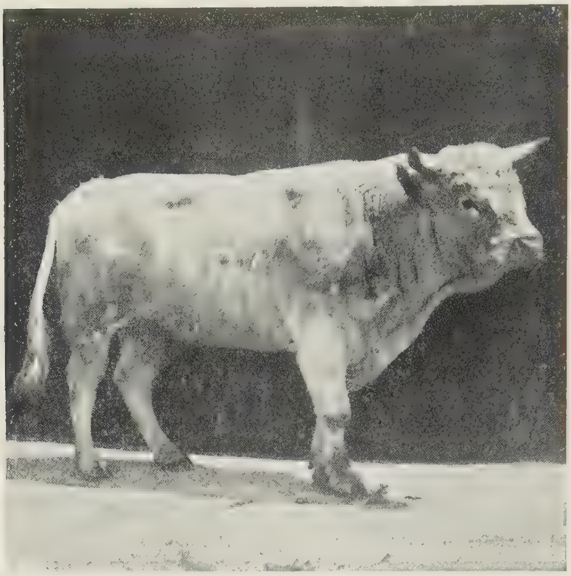


Photo by W. P. Dando

ENGLISH PARK BULL

The similarity in shape to the best-bred modern shorthorns is obvious

BRITISH PARK-CATTLE, AND THE AUROCHS

THE so-called "WILD CATTLE" found in the parks of Chillingham and Chartley, as well as in Lord Leigh's park at Lyme, and in that of the Duke of Hamilton at Cadzow Castle, Scotland, are probably not the descendants of an indigenous wild race. It is not without reluctance that the belief in their wild descent has been abandoned. But the evidence seems fairly conclusive as to the antiquity of these white cattle, regarded as a primitive breed, and of the unlikelihood of their being survivors of a truly wild stock. They are almost identical in many points with the best breeds of modern cattle, and probably represent the finest type possessed by the ancient inhabitants of these islands. But they are far smaller than the original WILD OX, or AUROCHS, the ancestor of our domestic breeds. The skulls of these large wild oxen, which still survived in the Black Forest in Cæsar's time, have been dug up in many parts of England, especially in the Thames Valley, and may be seen at the Natural History Museum. The remains of the extinct wild ox, the *Bos urus* of the Romans, show that, if not so large as an elephant, as Cæsar heard, its size was gigantic, reckoned by any modern cattle standard whatever. It probably stood 6 feet high at the shoulder, and there is every reason to believe that it was the progenitor of the modern race of domestic cattle in Europe. It seems certain that the Chartley Park herd did once run wild in Needwood Forest; but so do the Italian buffaloes in the Maremma, and the Spanish bulls on the plains of Andalusia. Those at Chartley have been kept in the park, which is very wild and remote, so long that they have gradually lost many of the attributes of domestication. This is even more marked in the case of Lord Tankervill's white cattle at Chillingham. An observant visitor to Chillingham lately noted that the bulls fight for the possession of the cows, and that one is occasionally killed in these combats. The cows still "stampede" with their calves when alarmed, and hide them for a week or ten days after they are born. The horns of the Chillingham cattle turn up; those of the bulls of the Chartley herd are straight or slightly inclined downwards. Cross-breds between the Chartley cattle and some other herds of reputed ancient descent may generally be seen at the London Zoological Gardens. They remain remarkably true to type.

Photo by W. P. Dando

CALF OF ENGLISH PARK-CATTLE

Though the stock is very old and inbred, the white park-cattle are still fairly prolific

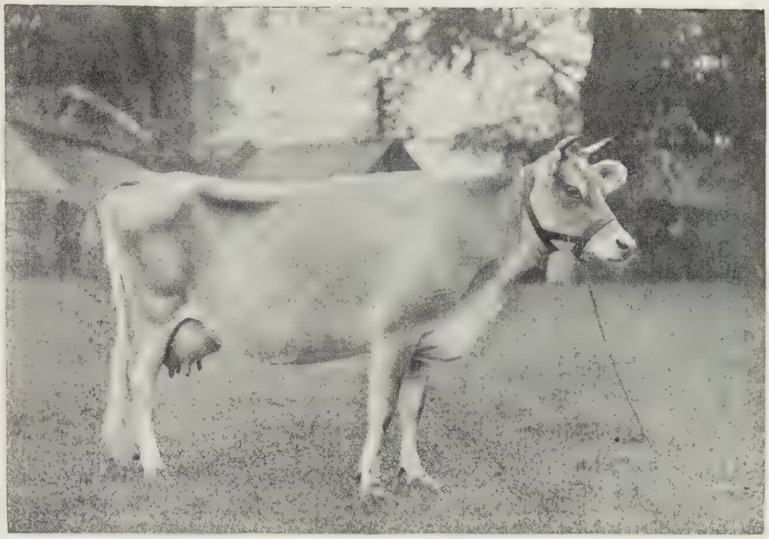


Photo by J. T. Newman

JERSEY COW

Though small in size, the Jersey cows produce more butter than any English breed

Formerly there were several other herds of ancient white cattle. One was at Gisburne, in Yorkshire; another at Chatelherault Park, in Lanarkshire; and records of herds at Bishop Auckland in Durham, Barnard Castle, Blair Athol, Burton Constable, Naworth Castle, and other ancient peaks are preserved. Probably all were of a breed highly prized in ancient days, which was allowed the run of the forests adjacent to the homes of their owners; then, as the forests were cleared, they were gradually taken up and enclosed in parks. Another theory is, that they were the white cattle of North-western Italy, imported by the first settlements of Italian monks after the conversion of the Saxons.

SOME DOMESTICATED CATTLE

THE various species of European domestic cattle have in most cases been brought to a degree of excellence even higher than that which might be expected from the long period of time in which their improvement has been an object of solicitude to man. Of the foreign races, the dark red cattle of the Spanish Peninsula — animals which have been exported to the Canary Islands and Madeira with great success — are justly famous. The white oxen of North-east Italy have been famous since the days of the Romans. The tall long-horned cattle of Hungary are excellent alike as beasts of draught and for beef. The black-and-white Dutch cows are, and have been, the mainstay of the dairy industry of Holland, and later of Denmark; while the small Brittany cows are perhaps the best butter-producers on the continent of Europe. But England and the Channel Islands may justly claim to rear the finest cattle of the temperate parts of the world. The diminutive Jersey cows, now reared in all parts of the kingdom, surpass all the animals of Europe or America in the richness of their milk, while stock from the pedigree herds of various English breeds is eagerly sought by foreign and continental buyers on both sides of the Atlantic, and in New Zealand and Australia. These foreign strains need constant replenishing from the English herds, and the result is a golden harvest to the breeders in these islands.

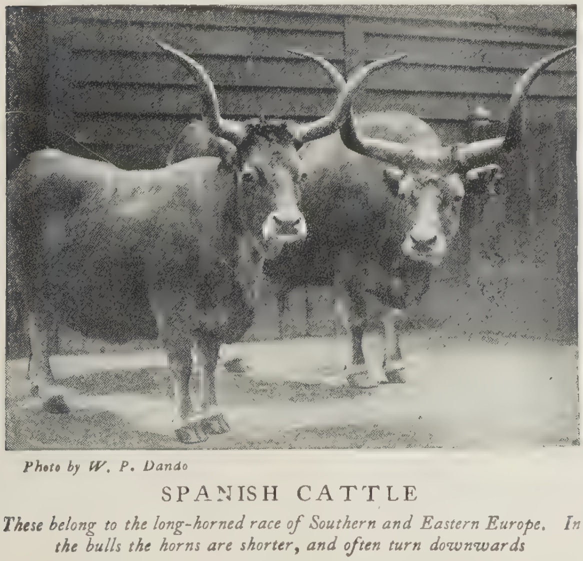


Photo by W. P. Dando

SPANISH CATTLE

These belong to the long-horned race of Southern and Eastern Europe. In the bulls the horns are shorter, and often turn downwards

The SHORTHORN was the first breed to be brought to perfection. Two main stocks — one for producing beef, the other for the dairy — are recognised; they are the "all-round breed" most in favour, and it is said that the improvement in this race alone has raised the value of average Irish store cattle $10 per head during the last twenty years. The shorthorns are level-backed, large animals, maturing very quickly. The commonest colours are roan, white, red, and red-and-white. HEREFORD CATTLE are red, with white faces and long, upturned horns; they fatten quickly on good grass, and are in most demand for summer beef. HIGHLAND CATTLE have long horns, rough, shaggy coats, and bodies of moderate size and great symmetry; they are grazed on the mountains of the West Highlands mainly, and fattened in the south. The beef is of the finest quality. SUSSEX CATTLE are an "all red" variety, large, and formerly much used for draught and farm work. The DEVONS are another red variety, very like the Sussex, yielding excellent and rich milk, and, when fattened, being little inferior to any breed as beef. The long-horned black WELSH CATTLE grow to a great size, as do the polled ANGUS breed of Scotland. The polled or hornless cattle include the red SUFFOLKS, a most valuable breed, hardy, and wonderful producers of milk. The cows often give milk every day of the year. The LONGHORN breed is almost disappearing, as the horns are a disadvantage both in the fields and when the animals are carried on board ship or in the train. The HUMPED CATTLE of India and East Africa belong to a race different from European cattle, of which the parent stock is not known. They have a hump upon the withers, drooping ears (a sign of ancient domestication), and a very large dewlap. The coat is always exquisitely fine. They are of all sizes, from the tall Brahminee bull to dwarf breeds not larger than a Newfoundland dog. The commonest colours are cream, grey, mouse-colour, and white. They do not low, but grunt, and are by no means so fond of shade and water as European cattle.

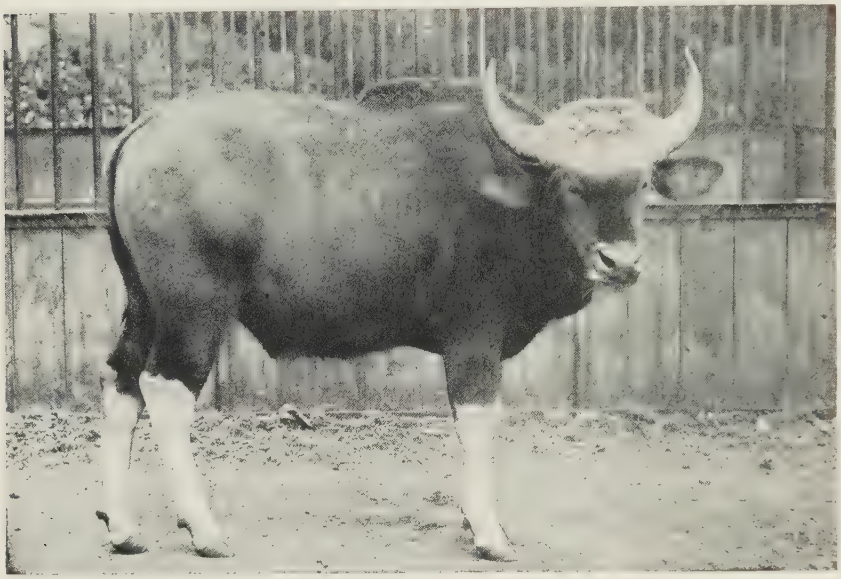


Photo by G. W. Wilson & Co., Ltd.

YOUNG GAUR

The largest and handsomest of the wild oxen

WILD OXEN

THIS group consists of the GAUR of India; the GAYAL of Assam, which is possibly a domesticated form of the gaur, but rather smaller in size, with skull and horns different in character; and the BANTING, a lighter and more slender wild ox, of which different varieties are found in Burma, in Java (where it is kept in a half-domesticated condition), and in Manipur.

THE GAUR

The GAUR, the so-called INDIAN BISON, is probably the largest of all the wild bovine animals. It is found at the foot of the North-eastern Himalaya, in the Central Provinces of India, the forests of Madras and Mysore, and in parts of Burma and the Malay Peninsula, but not in Ceylon. Its range eastward is not accurately known. In habits the gaur is mainly a forest animal, retiring always at daybreak into the depths of the jungle. It sometimes attains a height of over 6 feet at the shoulder, and a length of 9 feet 6 inches from the nose to the tail. The colour of the full-grown gaur is dark brown, turning to black; the legs from above the knees and hocks to the hoofs are white, the hair being short and fine. Its horns are upturned, and tipped with black, with white hair covering the junction on the top of the skull. The cows are much smaller than the bulls, standing about 5 feet high at the shoulder. This species feeds both on grass and on the young shoots of trees and of bamboos. The calves are dropped in August and September. The pure-bred animal does not appear capable of domestication.

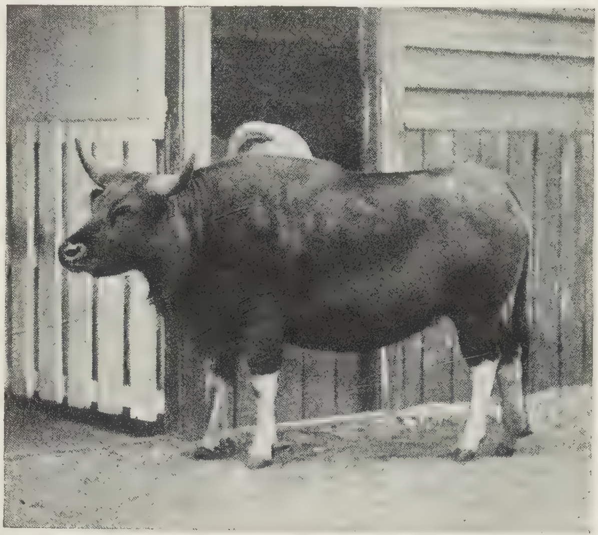


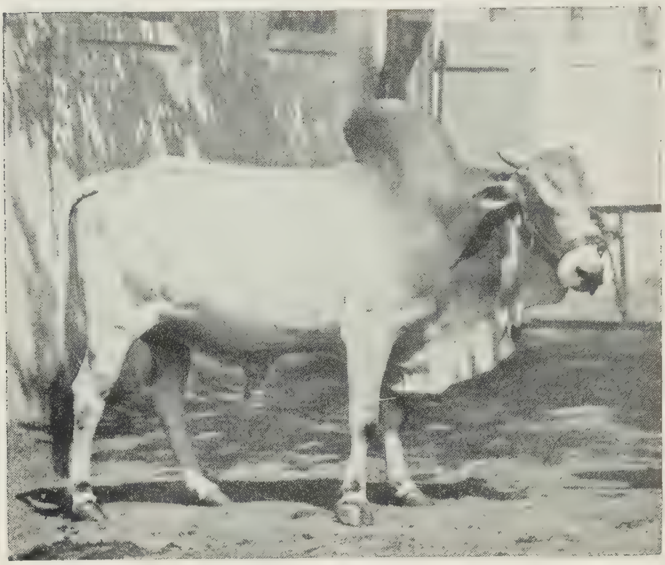
Photo by York & Son

COW GAYAL

This animal is not at all dissimilar to the gaur. Its chief points of difference are in the horns and in the colour of its skin

Hunting gaur by tracking in the jungle has long been a favourite sport of Anglo-Indians. General Douglas Hamilton says: "I have killed bulls measuring 6 feet at the shoulder, and the average height of the male is from 5 feet 8 inches to 5 feet 10 inches. An old bull gaur is a magnificent animal. The normal colour is a brownish black, sometimes in very old specimens almost quite black. The white stockings reach from the hoof to above the knee, and are very conspicuous. When on the Anamalies, I had a grand fight with a big bull. I was out early, and came on the spoor of bison, and soon saw two, one a very large bull. To my disgust he lay down, and was completely covered by creepers and bushes. After a bit I attempted to move to get a better view; but there to my left was a cow bison staring at me. She at once gave the alarm, and I waited for the large bull to rise. This he did so quickly, and disappeared so suddenly, that I only got a snapshot. As I stopped to load, I saw a young calf squatting at the foot of a tree like a hare, intently watching me. I put the rifle down, crept up behind the tree, and suddenly threw myself on the little calf, and managed to get hold of its hind legs, but it got from under me. I managed, however, to tie its fore legs securely by means of some slender stems from the creepers. All this time it continued to bellow and to make a great row, and I fully expected to see the mother come charging down. I went back to the bungalow, and got some men to bring my little captive home. After breakfast I started again, and got on the track of the bison. . . . I saw some branches move, and on looking carefully perceived a large bull bison; but he was among the thick bushes, and I could not see his outline. I guessed as nearly as possible the position of the shoulder, and fired the big rifle at him. He gave a bound forward, and then stopped long enough for me to give him a shot with the other barrel. . . . The next moment I saw the bull standing on the high ground above us. I fired again, and hit him well behind the shoulder. He dashed off, but only went fifty yards, and then stopped. I walked up, thinking to finish him, when he made a fearful rush at me. My man put the double rifle into my hands and then bolted, and I thought it prudent to retire and await my opportunity. But he only moved a few paces forward, and then stopped. Then began a regular siege of his position." The result of the siege was that the bison received four more bullets, charged and routed the hunter twice, and then walked off. It was shot twice more, charged again, and was finally killed by General Hamilton with his hunting-knife tied to a bamboo spear-pole.

Considering the size and tenacity of life of the gaur, it is rather wonderful that more accidents do not occur in the pursuit of this animal; but as it lives mainly in thick jungle, where large trees grow, the sportsman has more chance of getting out of sight of a wounded animal than when attacked by the Indian buffalo, which generally haunts jungles of high grass.



INDIAN HUMPED BULL

The hump and dewlap mark the Oriental cattle. The ears are often more drooping than in this specimen

THE GAYAL

The doubt whether this animal is found in a wild state has recently been considerably increased. It is well known in a semi-domesticated condition, in which it is kept by the tribes in and around the Assam Valley, where the wild gaur is also found. These herds roam during the day freely in the jungle, and return to be fed at the villages. It has been stated that wild gayal are enticed to join the tame herds by feeding them with balls of meal and salt; but these "wild" specimens may be only those which have belonged to or have descended from the domesticated herd. Gayal have been kept in England not only in the Zoological Gardens but in some parks, and crossed with English cattle. The offspring furnished excellent beef, but were rather wild and intractable. The horns of the gayal are thicker and flatter than those of the gaur, and placed lower on the skull and farther apart. The domesticated gayal stands lower than the gaur, but is a very massive animal.

THE BANTING

The common wild ox of the Malay countries of Borneo, Java, Eastern Burma, and northwards, in Manipur resembles the European oxen rather more than does the gaur. In size the bulls sometimes reach 5 feet 9½ inches. The old bulls are black, the younger bulls chocolate red, and the cows a bright reddish brown. The rump is marked with a large white patch, and all have white stockings from above the knees and hocks down to the hoofs. The tail is considerably longer than in the gaur, coming well below the hocks. As might be expected from its distribution, the size of this animal and the shape of the horns vary considerably in the different districts which it inhabits. In Borneo the horns often curve forwards; in Java they spread outwards. In the latter island large herds of this species are kept in a state of domestication. When wild, banting live in small herds, and in Burma feed from early morning until ten o'clock, when they retire into the jungle for shelter. The Manipur race is smaller than that of Burma (of which the males are not black), and the bulls have not the white rump.

THE YAK

THE YAK is naturally an inhabitant of the very high plateaux and mountains of Tibet, where the climate is cold and the air excessively dry. Lower down on the Indian side of the Himalaya a smaller race is found domesticated, which is the only one able to stand the climate of India, or of Europe, where it is now kept in some parks as a curiosity. The tamed yaks are usually much smaller than the wild; these sometimes reach a weight of between 1,100 and 1,200 lbs. In form they are long and low, very massive, and with hair almost entirely black; this falls off along the sides into a long sweeping fringe. The tail is thickly tasselled with fine hair, and is employed by Indian princes for fly-flaps. The wild yak has large, massive black horns, curved upwards and forwards in the male. In Ladak and Chinese Tibet the yaks inhabit a desolate and barren country, in which their main food is a dry, coarse grass, on which they nevertheless contrive to keep themselves in condition, feeding in the mornings and evenings, and lying down by day to rest among the rocks.

THE BISON

THE BISON form a marked group, differing from others of the Ox Tribe. They possess fourteen pairs of ribs, while the oxen have only thirteen (the yak has fourteen); and have very heavy, massive heads, broader and more convex foreheads than the oxen, longer spinal processes on the vertebræ of the front part of the back, and larger muscles to hold the ponderous head, causing a hump, which in the American bison is very marked. There are two living species of bison, one of which is found in Europe, the other in North America.

THE EUROPEAN BISON

This is the most interesting survival of the primitive fauna of the Old World. It is still found wild, though protected, in a large forest in Lithuania, the property of the Czar of Russia, called the Forest of Bielowitza. A few are also left of the purely wild stock in the Caucasus. Those in Lithuania have been protected for several centuries, and the herd is numbered from time to time. In 1857 there were 1,898 of these bison left; in 1882 there were only 600; in 1889 the herd had sunk to 380, but in 1892 it had risen to 491. The presence of the bison in the Caucasus had been almost forgotten till Mr. Littledale and Prince Demidoff gave accounts of hunting it there quite recently. The ZUBR, as it is called, only survives in some very inaccessible parts of the mountains, preserved by the Grand Duke Sergius Michaelovitch, in the Kouban district. There it exists as a really wild animal. The dimensions of one recently shot were 10 feet from the muzzle to the end of the last vertebra of the tail. The Grand Duke has to obtain special permission from the Czar to shoot one whenever he goes to the Caucasus.

This bison seems to have been an inhabitant of most of the forests of Europe and Northern Asia; its remains show that it existed in Britain, and it was plentiful in the Black Forest in the time of Cæsar. It is the largest of all European quadrupeds, measuring as much as 10 feet 1 inch from the nose to the root of the tail, and standing nearly 6 feet high at the shoulder. Prince Demidoff states his belief that it is found on the southern slopes of the Caucasus Range between the hills and the Black Sea. The weight of this bison reaches 1,700 lbs. It is now rare to see more than five or six together. Though the animal is so massive, its horns are rather small and slender, and curve upwards. The mane—which, like the rest of the coat, is of a uniform rich brown—is thick and curly, but not developed like that of the American bison.

INDIAN HUMPED CATTLE

These are often called Zebu in Europe, but the origin of the name is unknown

THE BUFFALOES.

THE BUFFALOES are so far distinct from other species of wild cattle that it is said they will not interbreed with them; yet one species, the INDIAN BUFFALO, has been domesticated for a long, though unknown period, and is among the most valuable of tame beasts of draught, as well as for dairy purposes. The various buffaloes usually have little hair, especially when old, and have flatter shoulders than the gaur, gayal, or bison. The pairs of ribs number thirteen.

EUROPEAN BISON

These wild animals of the Caucasus are very much scarcer than formerly, and are in danger of becoming extinct

THE AFRICAN BUFFALO

Great differences in size and colour exist in the AFRICAN BUFFALOES. Whether they are separate species or not may be doubtful; but the small yellow CONGO BUFFALO, with upturned short horns, is a vastly different creature from the large black CAPE BUFFALO. There is also an Abyssinian or brown race of African buffalo, and another in Senegambia smaller than the former, and a reputed grey race near Lake Tchad. The Cape buffalo is a heavy, thickset animal, all black in colour, with large massive horns covering the skull, and nearly meeting in the middle line of the forehead. In height it varies from 4 feet 10 inches to 5 feet at the shoulder. This species ranges from South Africa to the Congo on the west, and to the region of the Equator on the east of the continent. Firearms, and lately rinderpest, have greatly reduced the number of these creatures. They live and feed in herds, and, like the Indian species, are fond of the neighbourhood of water, in which they bathe, but are not so dependent on bathing and wallowing as the former.

Fully as formidable as the Indian buffalo, and much like it in habits, the African species is quite distinct. It has different horns, broad at the base and curled and tapering at the ends. Among the extreme measurements of the Indian buffalo's horns recorded is one of 12 feet 2 inches from tip to tip along the curve. Those of the African buffalo are seldom more than 6 feet, measured in the same way. By far the greatest number of hunting accidents in Africa are caused by the buffalo. Sir Samuel Baker shot a buffalo bull one evening near the White Nile. His men actually danced upon the body, when the animal rose to its feet, and sent them flying into the river like so many frogs. It then disappeared in the thick vegetation. On the following day, supposing that it must have died during the night, thirty or forty men, armed with double-barrelled guns, went to look for it. The result was thus recorded by Sir Samuel Baker: "They had not been ashore for many minutes when I first heard a shot and then a regular volley. My people returned with the head of the buffalo and a large quantity of meat, but they also carried the body of my best man, who, when leading the way through the high reeds, following the traces of blood, actually stumbled upon the buffalo lying in the swamp, and the light guns failed to stop its charge. The crooked horn had caught him behind the ear, and, penetrating completely through the neck, had torn out the throat as though it had been cut. The savage beast had then knelt upon the body, and stamped it into the muddy ground, until it fell beneath the fire of thirty men."

The head and body of a male Cape buffalo are 9 feet long. It is stated that the parasite conveyed by the tsetse fly remains in the blood of the buffalo (which is not affected by it), and that this forms a reserve whence the fly, after sucking the blood of the buffalo, poisons other animals.

THE CONGO BUFFALO

This is a very small race, the height at the shoulder being about 3 feet 6 inches. The shape of the horns varies, but they are wrinkled at the bases and flattened, and turn upwards, ending in thin, sharp tips. The hair is bright reddish yellow. It is entirely a West African species. Sir Samuel Baker records an instance in which his brother was nearly killed by a small West African buffalo, probably one of the species in question. It is said to be less gregarious than the Cape buffalo, and usually found in pairs.

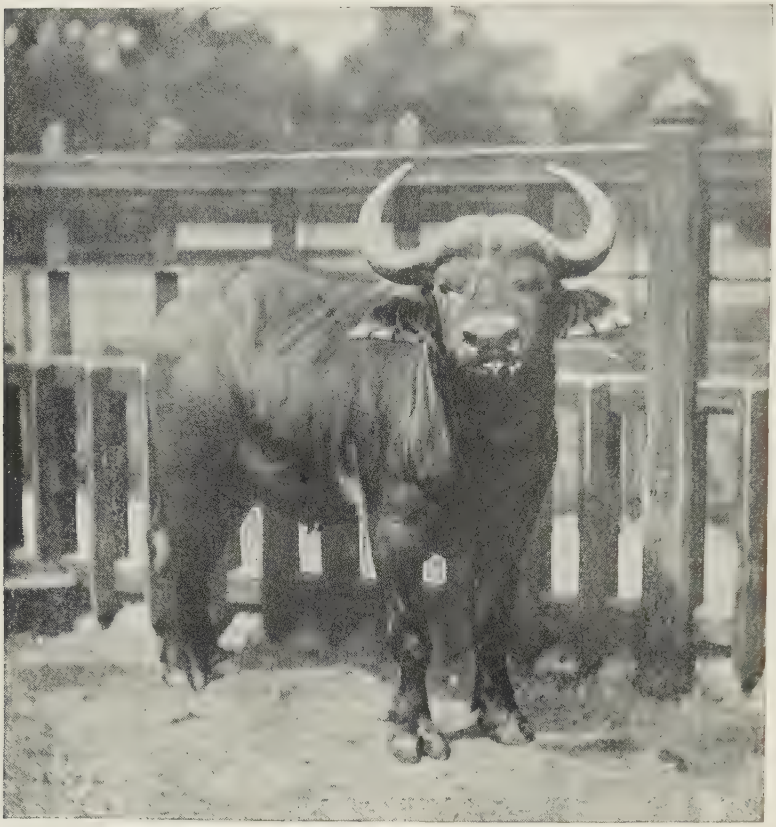
THE INDIAN OR WATER-BUFFALO

Very great interest attaches to this animal, if only from the fact that it is evidently a species domesticated directly from the wild stock. It therefore deserves consideration both as a wild and as a domesticated animal. It is found wild in the swampy jungles at the foot of the Himalaya, in the Ganges Delta, and in the jungles of the Central Provinces; also, it is believed, in the jungles of West Assam. Like the African species, it is an animal of great size and strength, with short brown hair, white fetlocks, and immense long, narrow, flattened horns. It is almost aquatic by preference, passing many hours of each day wallowing in the water, or standing in any deep pool with only the tips of its nostrils and its horns out of the water. By general consent it is the most dangerous of Indian animals after the tiger. A buffalo bull when wounded will hunt for its enemy by scent as persistently as a dog hunting for a rabbit. A writer in *Country Life* lately gave an account of a duel between himself, armed with a small and light rifle, and a buffalo bull, in which the latter hunted him for more than an hour, each time being driven off by a shot from the light rifle, and each time returning to the search, until it was killed. Sir Samuel Baker, when he first went to Ceylon, found the buffaloes practically in possession of the meadows round a lake in the neighbourhood of his quarters, and waged a war of extermination against the bulls, which were very dangerous

Photo by W. P. Dando] [*Regent's Park*

DOMESTICATED YAK

The wild bovine animal of the Central Asian plateau, tamed and domesticated

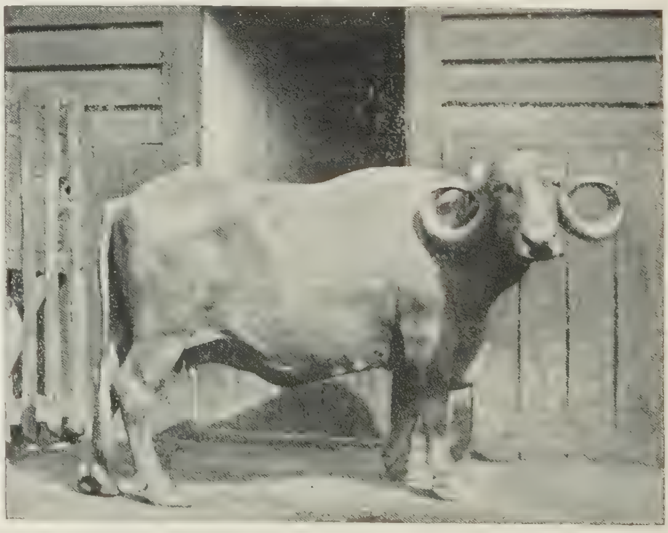


CAPE BUFFALO

Notice the striking difference depicted on this page between the two species of buffalo — the Indian and the Cape

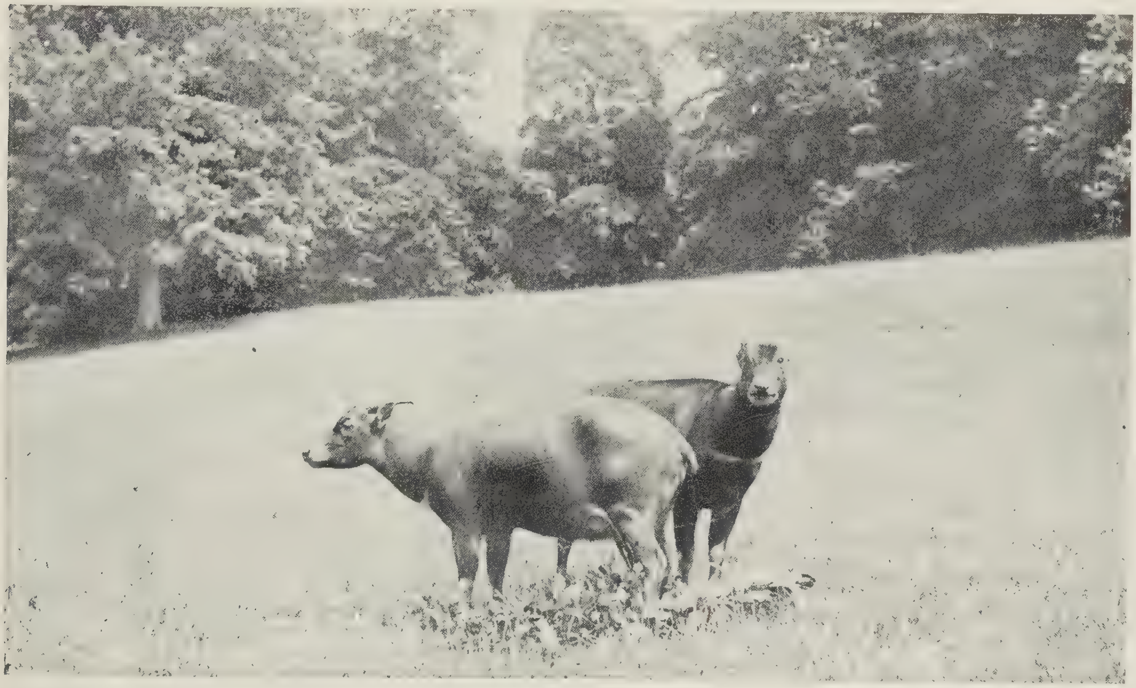
The buffaloes of Ceylon are the same as those of India, but the horns are inferior in size. "The charge of a buffalo is a serious matter," says Sir Samuel Baker. "Many animals charge when infuriated, but they can generally be turned aside by the stunning blow of a rifle-shot, even if they be not mortally wounded. But a buffalo is a devil incarnate when it has once decided on the offensive; nothing will turn it. It must be actually stopped by death, sudden and instantaneous, as nothing else will stop it. If not killed, it will assuredly destroy its adversary. There is no creature in existence so determined to stamp the life out of its opponents, and the intensity of its fury is unsurpassed when a wounded bull rushes forward upon its last desperate charge. Should it succeed in overthrowing its antagonist, it will not only gore the body with its horns, but will kneel upon the lifeless form, and stamp it with its hoofs till the mutilated remains are beyond recognition."

The true Indian buffalo is usually shot from the back of an elephant. Hunting it on foot is dangerous in the extreme, for the buffalo can crash through obstacles which would prevent any man from making his way through them when escaping. When domesticated, the Indian buffalo loses most traces of its savageness; it is habitually managed by the children, who take the herds out to graze in the jungle, and drive them back, often riding on one of the bulls, at night. They dislike Europeans, and often show this by attacking them; but otherwise they are quite tame, and are docile when in harness or carrying burdens. The buffalo's milk is very rich, and makes a much larger per-



DOMESTICATED INDIAN BUFFALO

This animal is found as a wild and domesticated species in India. It is valuable as a beast of draught and for the dairy centage of butter than ordinary cow's milk. So useful is this mud- and water-loving animal in all swampy districts, that wherever rice is cultivated it is almost indispensable. The result is that the Indian buffalo has been transported, probably in comparatively modern times, to many distant quarters of the globe. When this was done is not known; but it is probable, for instance, that it was not known in Egypt in the days of the Pharaohs, for its form never appears in the paintings and sculptures. Now it is seen very far up the Nile, and plays an important part in Egyptian agriculture; it is also the general beast of burden and for the dairy in the Pontine Marshes of Italy. In Spain it was probably introduced by the Arabs, and is used to cultivate the marshy plains near the mouths of the rivers of Andalusia; it is also in use in the marshes of Hungary, in the Crimea, and across Western Asia to Afghanistan. We have thus the curious fact that a wild animal once confined to the jungles of the Indian Peninsula is now domesticated on two other continents. It has not been introduced into America yet, though it would be useful in the Mississippi swamps; but the Chinese have taken it to the Far East, and established it as their favourite beast of burden.



A PAIR OF ANOAS

The anoa is the smallest and most antelope-like member of the Ox Tribe

THE TAMARAU AND ANOA

In the island of Mindoro, in the Philippines, a small black buffalo, with upright, slightly incurved horns, is found in the dense forests. The height at the shoulder is about 3 feet 6 inches; a few irregular marks of white are found on the fore legs, face, and occasionally the throat. It is called the TAMARAU by the natives, most of whom fear to attack it. Its habits are said to be much the same as those of the other buffaloes; but it is reputed to fight with the Indian buffaloes which have escaped and become semi-wild in the forests.

In Celebes a still smaller wild forest-buffalo is found, called the ANOA. It is only 3 feet 3 inches high at the shoulder, and has upright, almost straight horns. The general colour is brownish, tinged with yellow, that of the adults being very dark brown or black. Scarcely anything is known of its habits.

CHAPTER XIV

THE SHEEP AND GOATS

THE SHEEP

THE sheep are represented at the present time by several wild species, one of which is found in Northern India east of the Indus, in the Punjab, and in Sind; one in North America; and another in North Africa. The rest inhabit the high ground of Europe and Asia as far south as the Himalaya. These mountains, with the adjacent plateaux of the Pamirs and the great ranges of Central Asia, form the main home of the group. Wild sheep are of various types, some so much like the goats that it is difficult to draw a hard-and-fast line between them; while others, especially the Curly-horned Argalis, Bighorns, Oorial, and Kamchatka Wild Sheep, are unmistakably ovine in type. The wild original of the domesticated breeds of sheep is unknown; but the extreme differences between various breeds of tame sheep — as, for instance, between the smooth-coated, drooping-eared breed of Nubia and the curly-horned, woolly sheep of Dorsetshire — must not be allowed to divert the attention from the considerable likeness of habit which still remains between other breeds and the wild species. Domesticated sheep which live on hills and mountains are still inclined to seek the highest ground at night. The rams fight as the wild rams do, and many of them display activity and powers of climbing and of finding a living on barren ground scarcely less remarkable than in the wild races. The apparent absence of wool in the latter does not indicate so great a difference as might be thought. The domesticated sheep have been bred by artificial selection for unnumbered ages in order to produce wool. It is said that in some of the wild breeds there is an under-fur which will "felt" like wool. Most of the species are short-tailed animals, but this is not the case with the Barbary wild sheep.

Wild sheep are mainly mountain-living animals or frequenters of high ground. They generally, although not always, frequent less rugged country than that affected by the wild goats, and some are found at quite low levels. The altitude at which other wild sheep are found is, however, very great; on the Pamirs it reaches 20,000 feet. Here the country is quite open.

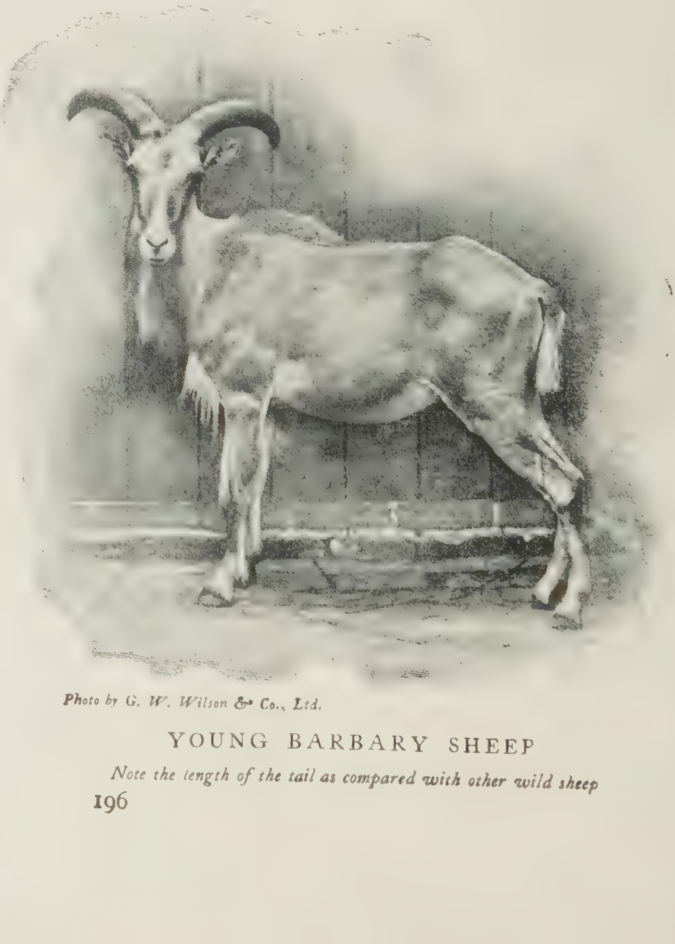


Photo by G. W. Wilson & Co., Ltd.

YOUNG BARBARY SHEEP

Note the length of the tail as compared with other wild sheep

THE EUROPEAN MOUFFLON

The only wild sheep of Europe is the MOUFFLON, found in the mountains of Corsica and Sardinia. Its height at the shoulder is about 27 inches. In the rams the horns are strong, and curved into a spiral, forming almost a complete circle. The hair is close, and in winter has a woolly under-fur. In summer and autumn the coat is a bright red-brown on the neck, shoulders, and legs; the rump and under-parts are whitish, and the back and flanks marked with a white saddle. In winter the brown becomes darker and the white saddle broader. A rather larger moufflon is found on Mount Elburz in Persia, in Armenia, and in the Taurus Mountains. A smaller variety exists in Cyprus, where it has been preserved since the British occupation. The moufflon is a typical wild sheep. In Sardinia and Corsica are dense scrubby forests of tall heather, some 5 feet high. This *maquia* is practically impenetrable to hunters. When alarmed, the moufflon dash into it, and are safe. The *maquia* has preserved two very interesting survivals of antiquity — the moufflon, and the Corsican or Sardinian bandit. The Corsican bandit, like the moufflon of the same island, is nearly extinct. In Sardinia both flourish. Many sportsmen have had their first taste of big-game shooting in the difficult pursuit of the moufflon on the Sardinian mountains. Some declare that the sport is so fascinating that they have seldom found much to equal it since. Mr. S. H. Whitbread, whose notes in "The Encyclopædia of Sport" are very full on this subject, deems that the best season to stalk moufflon is in October or November. The animals are then less disturbed by shepherds and dogs, and the moufflon are on the move and more easily seen during the day than in summer, when they feed at night and rest or sleep by day.

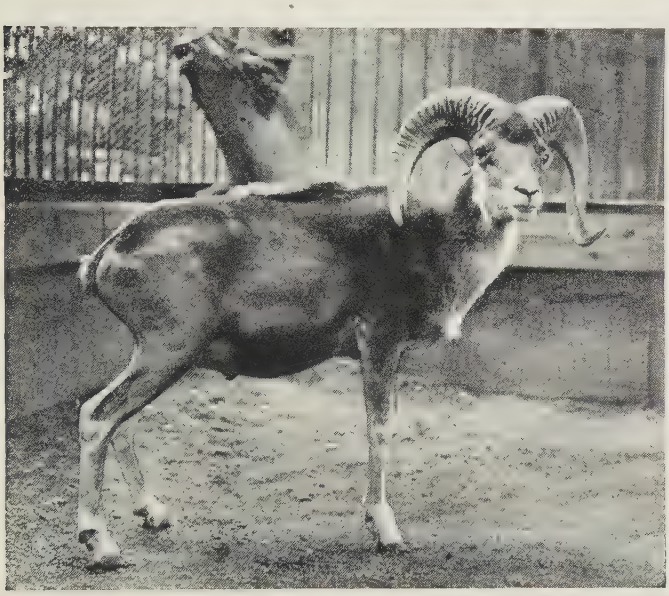


Photo by W. P. Dando

SIBERIAN ARGALI

One of the large wild sheep of Central Asia

There is a small herd of moufflon running wild in one of the English parks. They have a specially built "mountain-top" of stone to make a home of, but are free to feed where they like in the park. They produce lambs yearly. It is an interesting sight to see the quick rush of the little flock, when frightened, to their sheltering-place, led by an old white saddled ram.

THE ARGALIS

The ARGALIS are the largest of all living wild sheep. Some measure from 3 feet 9 inches to 4 feet at the shoulder. The horns are broad, corrugated, and curling in the male, and in the female short, erect, and curving backwards. The male TIBETAN ARGALI has a ruff on the throat. The usual colour is a stony grey, mingled with white in the summer in the case of the old males. The name is applied collectively to several wild sheep found in Northern and Central Asia. Whether these are only varieties or separate species it is difficult to say; but the following are some of the most marked forms.

The SIBERAIN ARGALI is the characteristic wild sheep of the rocky hills and mountains of Southern Siberia, the Altai Mountains, and Northern Mongolia. The horns curve so as to form more than a complete circle; the upper parts are tinged with grey, and the lower are white.

BARBARY SHEEP

These fine wild sheep are found in the Atlas and Aures Mountains of North Africa

The TIBETAN ARGALI is a little smaller in size, and has slightly smaller horns. The rams have also a large white ruff on the throat. These sheep descend in winter to the lower valleys of the Tibetan plateau, returning to the higher ground in spring. The lambs are born in May or June.

LITTLEDALE'S SHEEP is a smaller animal, found on the Sair Mountains in the Great Altai, on the northwestern border of Mongolia. It is darker in colour than the argali or Marco Polo's sheep, and has dark under-parts.

Writing of the argali of Southern Siberia, the naturalist Brehm says that when the Tartars want mutton an argali hunt is organised. The Tartar hunters advance on their horses at intervals of 200 or 300 yards, and when the sheep are started generally manage, by riding, shooting, coursing them with dogs, and shouting, to bewilder, shoot, or capture several.

On the high plateau of the Pamirs and the adjacent districts MARCO POLO'S SHEEP is found. The rams are only slightly less in size than the Siberian argali; the hair is longer than in that species, and the horns are thinner and more slender and extend farther in an outward direction. An adult ram may weigh 300 lbs. The first description of this sheep was given by the old traveller whose name it now bears. He said that on the Pamir plateau wild animals are met with in large numbers, particularly a sheep of great size, having horns three, four, and even six palms in length.

BARBARY SHEEP

This shows a fine ram, with a mane reaching almost to its hoofs

THE OORIAL.

The vast range of the Himalaya affords feeding-ground to other species of wild sheep and wild goat, so different in the shape of the horns that the variations of the ovine race under domestication need not be matter for wonder when so much variety is seen in nature.

The OORIAL, or SHA, is found from North-west India to Persia. The horns make a half-curve backwards, and are flattened. The coat is of reddish-brown colour, with white on the belly, legs, and throat. This species is the only wild sheep found in India proper.

THE BARBARY SHEEP, AOUDAD, OR ARUI

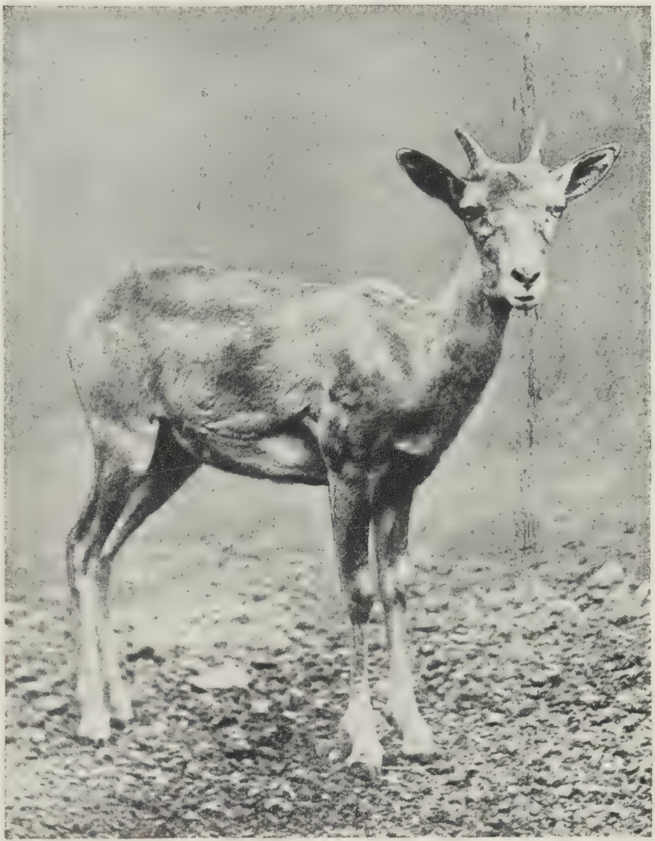


Photo by J. T. Newman] [Berkhamsted

PUNJAB SHEEP

This is an example of one of the breeds which carry no wool whatever

This is a large wild sheep of the North African highlands. The old rams have a very fine appearance, with a long flowing beard or mane, and large horns. These wild sheep, though somewhat goat-like in appearance, are typical of their race in general habits. They live in the Atlas Range, and in the splendid heights of the Aures Mountains, which lie at the back of Algeria and fringe the great Sahara Desert. In the isolated and burning rocks which jut up in the desert itself into single mountains they are also found, living on ground which seems absolutely destitute of water, grass, or vegetation. They live singly or in small families; but the rams keep mainly alone. Sometimes they lie in shallow caves during the heat of the day. These caves smell like a sheep-fold. More generally the sheep repose on some shelf of rock, where they exactly match the colour of the stone, and are invisible. The ground is among the most difficult in which any hunting is attempted, except perhaps in chamois stalking; but the pursuit seems to fascinate sportsmen. Mr. A. E. Pease recently gave some charming descriptions of the silence, the rugged rocks, and the astonishing views over the great orange Sahara Desert seen from the tops of these haunts of the Barbary sheep—mountains on the summits of which his Arab guides would prostrate themselves in evening prayer as the sun sank over the desert, and then, rising, once more resume the chase. The young lambs of the Barbary sheep are charming little creatures, more like reddish kids. They can follow the mother over the steepest ground at a great pace. When caught, as they sometimes are by the Arabs, they soon become tame. The

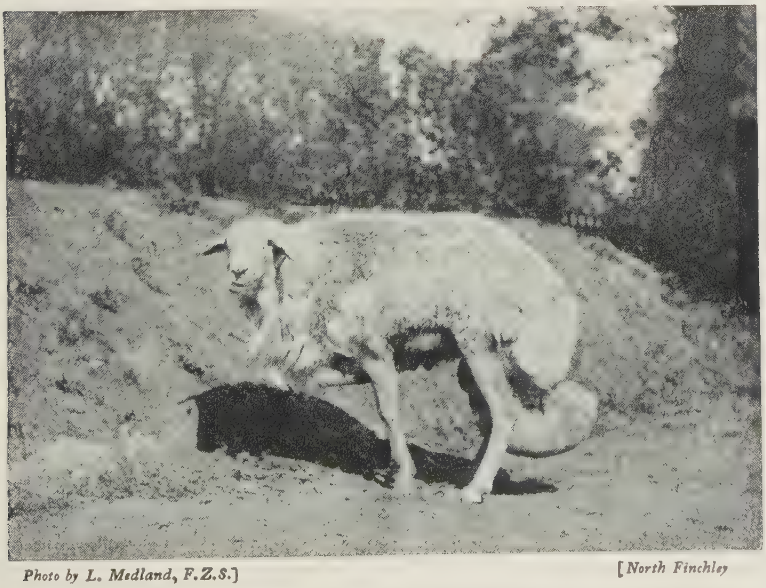


Photo by L. Medland, F.Z.S.] [North Finchley

FAT-TAILED SHEEP

The fat tail of this sheep was considered by Charles Darwin as due to degeneration

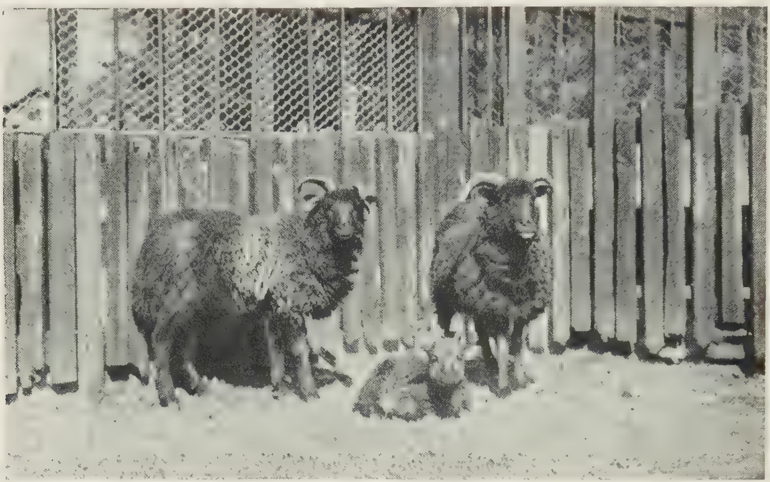


Photo by W. P. Dando] [*Regent's Park*

FOUR-HORNED SHEEP

There are several breeds of these sheep, some from China, some from Iceland, and others from South Africa

tail is longer than in other wild sheep, and in the males a large mane covers the chest.

THE BURHAL, OR BLUE SHEEP

This species possibly indicates the transition-point from the sheep to the goats. It was pointed out by Mr. Brian Hodgson that it had certain features more like the goats than the sheep, and later other writers laid stress on structural differences of the same kind, both in skull and horns. It has not the disagreeable odour of the goats; but the black markings which separate the white of the belly from the brown of the flanks, and run down the front of the legs, are like those seen on some goats. The horns rise in a curve outwards and downwards. The largest are only some 30 inches long.

Burhal are perhaps the commonest of all Asiatic wild sheep. They inhabit the whole length of the higher Himalayan Range, and are found over and round the Central Asian plateau as far north as Yarkand. The horns make two half-moons at right angles to the skull. Unlike some of the other wild sheep, burhal often climb the very highest ground of all. Much of the best burhal ground is above 17,000 feet high, and, as Mr. Whitbread remarks, this alone makes the chase of such an animal difficult. As in the moufflon, the mutton is excellent. There is no difficulty whatever in taming these wild Himalayan sheep; those in the Zoological Gardens are practically domesticated.

DOMESTICATED SHEEP

Under domestication sheep exhibit a wide variety of coat, shape, and size, very striking to the eye, and very important in regard to the produce of wool or mutton. The introduction of a particular breed, with long wool or short wool as the case may be, has often saved or altered for a time the economic condition of a colony or province. It was the introduction of the sheep which gave Australia first rank among the rich colonies of the world; and the discovery that the Cheviot breed would thrive on the Scotch hills made millions of acres remunerative which might otherwise have been very unproductive. But the only important change in the structure of the sheep in domestication is the lengthening of the tail. The carcase may be fat mutton or thin mutton, the wool long or short, fine or coarse; but the sheep itself remains true to type, and of much the same docile habits, under all the changes of the breeders.

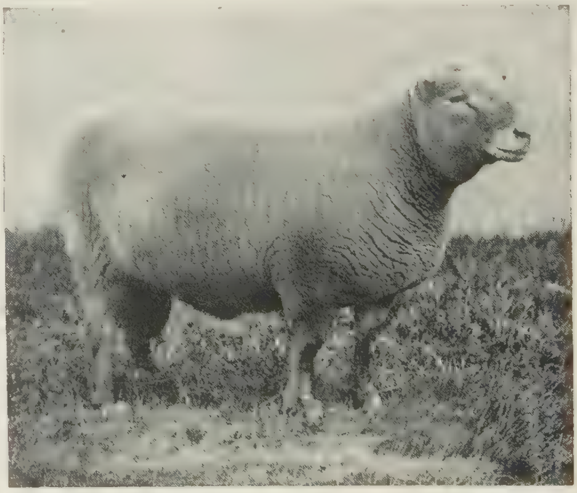


Photo by J. T. Newman] *Berkhamsted*

SOUTH DOWN SHEEP

The finest breed of down-sheep

We may first say a word or two as to foreign breeds of sheep, especially those of the East. Some of these resemble the wild breeds in having smooth coats and almost no wool. The SOMALI SHEEP, for instance, yield no wool useful for felting or spinning. They have drooping ears and black heads. Some of the finest natural wool is developed by a white sheep in Tibet. The fur is usually sold as Tibetan lamb. The wool is exactly like white floss-silk. When cured by the Chinese, the leather is like white kid, with this flossy wool attached.

In India and Persia the sheep is sometimes used as a beast of burden. Mr. Lockwood Kipling, in his "Beast and Man in India," says: "Borax, asafœtida, and other commodities are brought into India on the backs of sheep in bags. The flocks are driven in large numbers from Tibet into British territory. One of the sensations of journeying in the hills of the 'interior,' as the farther recesses of the mountains are called by Anglo-Indians, is to come suddenly on such a drove, as it winds, with the multitudinous click of little feet, round the shoulder of some Himalayan spur. The coarse hair bags scrape the cliffside from which the narrow path is built out or hollowed, and allow but scant room for your pony, startled by the hurry and the quick-breathing rush of the creatures as they crowd and scuffle past. Only the picturesque shepherds return from these journeys. The carriers of the caravan (*i. e.* the sheep), feeding as they go, gather flesh in spite of their burdens, and provide most excellent mutton. . . . In the towns of the plains rams are kept as fighting animals. A Mohammedan swell going out for a stroll with his fighting-ram makes a picture of foppery not easily surpassed by the sporting 'fancy' of the West. The ram is neatly clipped, with a judicious reservation of the salient tufts, tipped with saffron and mauve dye, and besides a large collar of blue beads it wears a necklace of hawk-bells."

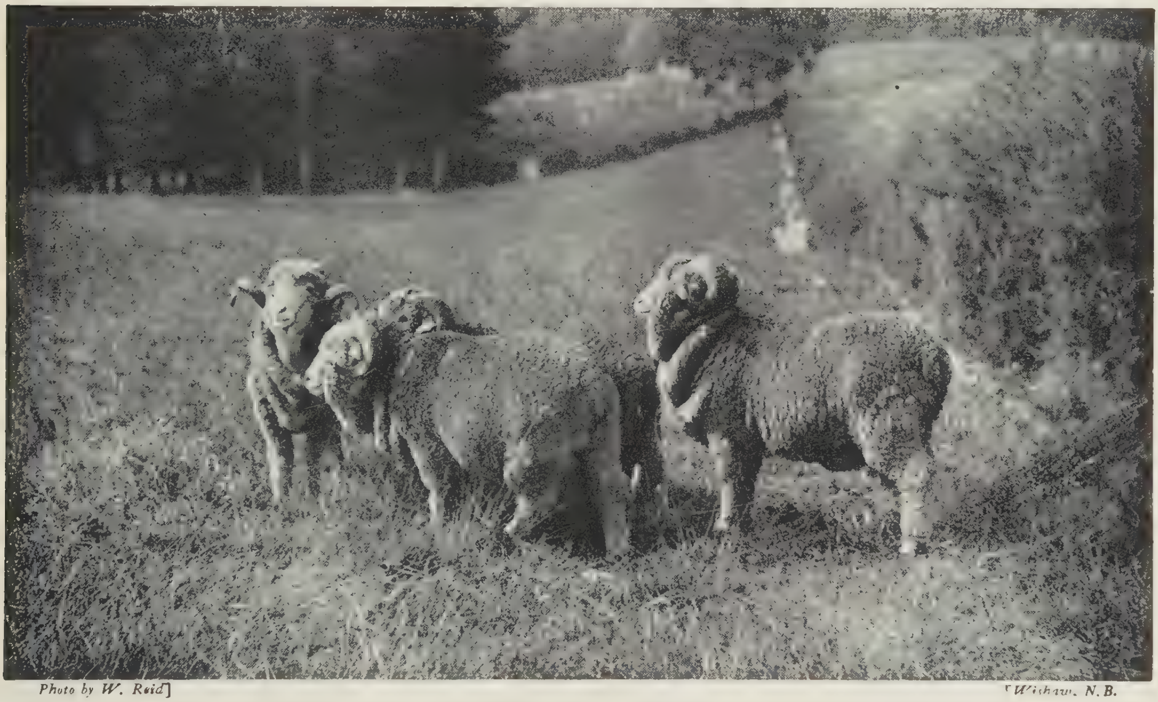


Photo by W. Reid] [*Wishaw, N.B.*

MERINO RAMS

The best wool-producing sheep. Imported from Spain to Australia

The FAT-TAILED SHEEP of Persia and Tartary exhibits a curious provision of nature. When food is plentiful, a quantity of fat accumulates on the tail and croup. As the pasture dries up and the animal finds little food, this store of fat is gradually absorbed. Another fat-tailed sheep is found from Syria and Egypt to the Cape. This has a long tail reaching to the

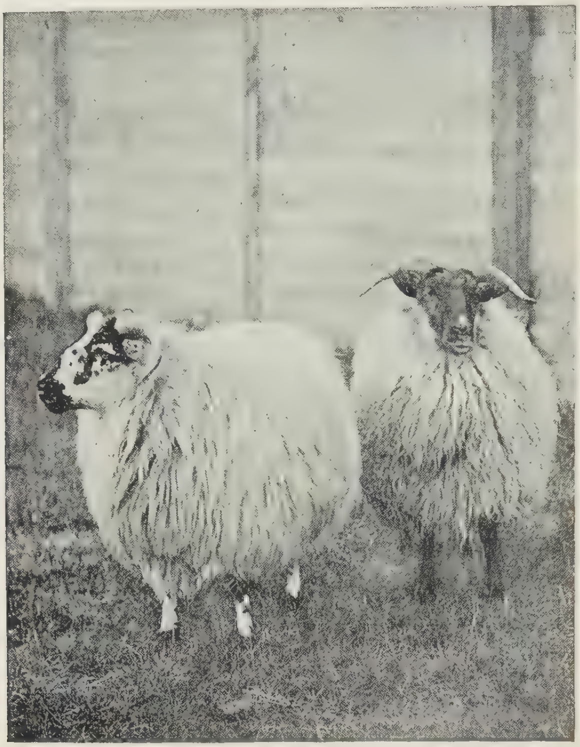


Photo by J. T. Newman] [*Berkhamsted*

BLACK-FACED MOUNTAIN-SHEEP

The sheep of the high mountains and heather-moors

ground. In the Egyptian breed the tail is broad throughout; in the Syrian it narrows to a point. The ordinary weight of the Syrian sheep's tail is 15 lbs.; but in some well fattened examples it reaches 70 or 80 lbs. Ludolph saw in Egypt a sheep's tail of 80 lbs. weight. This overgrown tail is a great encumbrance to the animal. In order to lighten the burden, the shepherds fasten under it a small board, sometimes with wheels attached, to make it easy to draw over the ground.

In Greece, Wallachia, and Western Asia a fine breed of sheep, quite different from the English forms, is seen. It is called the WALLACHIAN SHEEP. When the Zoological Gardens were first founded here, some of these sheep were introduced and crossed with English breeds. The horns are tall spirals, as in the great kudu antelope. The body is large, and the fleece long and straight, and more like that of the long-haired goats than curly wool.

There are now few countries in the world to which sheep have not been introduced. They were probably among the earliest animals to be domesticated. Certainly they are the first to be mentioned; for we learn that "Abel was a keeper of sheep," while Cain tilled the earth. The feud between the keeper of flocks and the grower of crops typified in this ancient quarrel still goes on wherever the wild mountain breeds of sheep are kept, for there is of necessity always danger that the wandering sheep may raid the plots of corn. In Spain a curious and ancient set of laws regulates the passage of the flocks to and from the mountain pastures through the corn-lands.

It is said that the name of the famous breed of Spanish sheep known as MERINOS recalls their foreign origin from across the sea, and that they were originally imported into Spain from England. Whether that be so or not, it is certain that no one could recognise them now. The finest merino sheep, especially those bred in Australia, into which country they were imported some forty years ago, look as if covered with a dense growth of moss. The close wool grows not only on their backs, sides, and bellies, but on legs, forehead, and nose. There are believed to be ten millions of merino sheep in Spain, most of which are migratory. They are called "transhumantes," and are taken from the plains to the mountains and from the mountains to the plains yearly. These

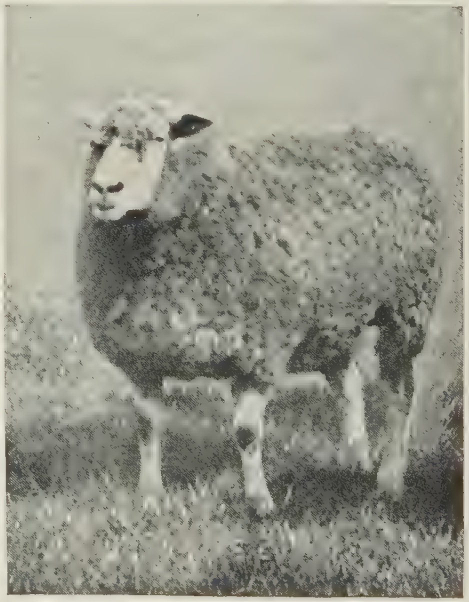


Photo by J. T. Newman] [*Berkhamsted*

LEICESTER EWE

A heavy, long-woolled breed

"transhumantes" are divided into flocks, each under a head shepherd, or "majoral." The flocks follow the shepherds, who lead the way, and direct the length and speed of the journey. A few wethers, trained to the business, follow the shepherds, and the rest come in due order. Powerful dogs accompany them as guards. This system of sheep migration is controlled by a tribunal termed the Mesta. It can be traced back to the middle of the fourteenth century. By it persons are prohibited from travelling along the course of the route pursued by the flocks so long as they are on the road. It also maintains the right for the flocks to graze on all the open or common land that lies in the way. Moreover, it claims a path ninety yards wide through all enclosed and cultivated country. The length of the journey is over 400 miles, which is accomplished in six or seven weeks. The system works greatly to the injury of local cultivators and stationary flocks, whose fields are injured by the migratory sheep.

Photo by W. Reid] *[Wishaw, N.B.*

CROSS-BRED SHEEP

The class of sheep kept mainly on cultivated land in the North Midlands

English Breeds of Sheep

In England are reared the finest and most valuable sheep. This is evident from the prices paid for them by foreigners and breeders in our colonies. Except for merinos, no one comes to any other country but this when about to seek new blood for their flocks or to stock new lands. Recently 1,000 guineas were paid by a firm in Argentina for a single Lincoln ram.

Differences, well marked and of great importance, exist between our different breeds. Each suits its own district, and each is carefully improved and kept pure by herd-books, in which all pedigree animals are entered.

The "general utility sheep" in England is the SOUTH DOWN; in Scotland, the BORDER LEICESTER. The former is a small, fine sheep, with close wool, and yielding excellent mutton. It provides the meat sold in our best shops, and has largely stocked New Zealand. The original breed of England was possibly the COTSWOLD; it is a tall, long-woolled, white-fleeced

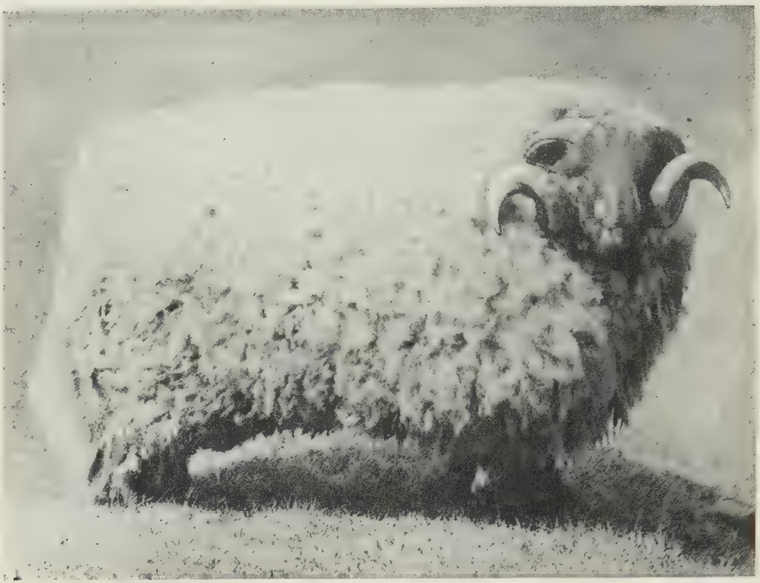


Photo by J. T. Newman] [*Berkhamsted*

LONK RAM

This is a photograph of the largest sheep on record

sheep. Later a large heavy sheep, with long wool and a massive body, was bred in the Midlands, and called the LEICESTER LONG-WOOL. This sheep gives a great cut of wool, and much coarse mutton. The CHEVIOT SHEEP, originally bred on the hills of that name, is now one of the mainstays of the Scotch mountain farmer. The Cheviots eat the grass on the high hillsides, while the BLACK-FACED HIGHLAND SHEEP live on the heather higher up. The SUFFOLK, OXFORD, HAMPSHIRE, and other "Down" sheep are larger breeds than the South Down. The ROMNEY MARSH SHEEP are a heavy long-woolled breed. The EXMOORS are small heather-sheep like those of Wales, and the SOA and ST. KILDA SHEEP, which are often four-horned, the smallest of all.

The maintenance of flocks is now almost an essential part of English agriculture on all chalk lands, which comprise a very large percentage of the southern counties. On the chalk downs the flocks are the great fertilisers of the soil. Every night the sheep are folded on the fields which are destined to produce corn in the following year. The manure so left on the soil ensures a good crop, with no expense for carting the fertiliser from the farmyard, as is the case with manure made by oxen kept in straw-yards.

On the South Downs, Oxfordshire Downs or Chiltern Hills, Salisbury Plain, and the Berkshire Downs the farms have been mainly carried on by the aid of the flocks. Where these are no longer kept the land reverts to grass, and the growing of corn ceases. On the coarse, new-sown grasses cattle take the place of sheep, and an inferior style of farming, like the ranches of South America, replaces the careful and highly skilled agriculture of Old England. In the far north of Scotland cross-bred sheep are now reared and fed in winter on turnips, which will grow luxuriantly where the climate is too bleak and wet for wheat.

Formerly cattle were the main source of wealth to the owners of Highland estates. The sheep was only introduced after the Highlands were subdued subsequently to the rebellion in 1745. It was found that the rough-coated heather-sheep throve on the wet and elevated hills. This led to their substitution for cattle, as wool was then dear. Sheep are now in their turn giving way to grouse and deer over much of the Central Highlands, as the price of wool has fallen.

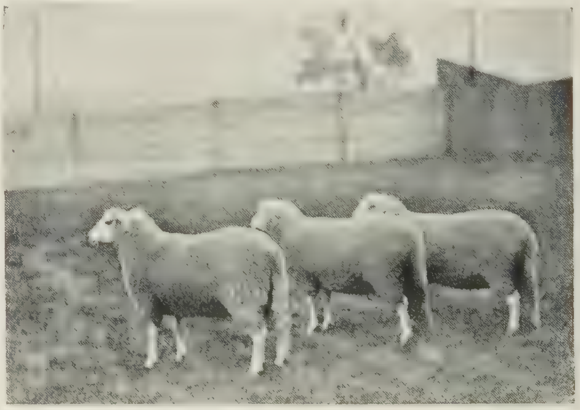


Photo by J. T. Newman] [*Berkhamsted*

WELSH EWES

A small breed of hill-sheep

THE GOATS

Photo by E. Landor] [Ealing

FEMALE ANGORA GOAT

The breed from which mohair is obtained

Though the dividing-line between the Sheep and Goats is very indistinct, some differences are of general application. The goats are distinguished by the unpleasant " hircine " odour of the males, and by beards on the chins of the same sex, by the absence of glands in the hind feet, which sheep possess, and by certain variations in the formation of the skull. The difference between the temperament of the sheep and goats is very curious and persistent, showing itself in a marked way, which affects their use in domestication to such a degree that the keeping of one or the other often marks the owners as possessors of different degrees of civilisation. Goats are restless, curious, adventurous, and so active that they cannot be kept in enclosed fields. For this reason they are not bred in any numbers in lands where agriculture is practised on modern principles; they are too enterprising and too destructive. Consequently the goat is usually only seen in large flocks on mountain pastures and rocky, uncultivated ground, where the flocks are taken out to feed by the children.

On the high alps, in Greece, on the Apennines, and in Palestine the goat is a valuable domestic animal. The milk, butter, and cheese, and also the flesh of the kids, are in great esteem. But wherever the land is enclosed, and high cultivation attempted, the goat is banished, and the more docile and controllable sheep takes its place. In Syria the goat is perhaps more docile and better understood as a dairy animal than elsewhere in the East. The flocks are driven into Damascus in the morning; and instead of a milk-cart calling, the flock itself goes round the city, and particular goats are milked before the doors of regular customers.

The EUROPEAN GOAT is a very useful animal for providing milk to poor families in large towns. The following account of its present uses was recently published: " The sheep, while preserving its hardy habits in some districts, as on Exmoor, in Wales, and the Highlands, adapts itself to richer food, and acquires the habits as well as the digestion of domestication The goat remains, as in old days, the

Photo by E. Landor] [Ealing

ANGORA RAM

These goats were originally obtained from Turkey in Asia, and exported to South Africa enemy of trees, inquisitive, omnivorous, pugnacious. It is unsuited for the settled life of the English farm. Rich pasture makes it ill, and a good clay soil, on which cattle grow fat, kills it. But it is far from being disqualified for the service of some forms of modern civilisation by the survival of primitive habits. Though it cannot live comfortably in the smiling pastures of the low country, it is perfectly willing to exchange the rocks of the mountain for a stable-yard in town. Its love for stony places is amply satisfied by the granite pavement of a 'mews,' and it has been ascertained that goats fed in stalls and allowed to wander in paved courts and yards live longer and enjoy better health than those tethered even on light pastures. In parts of New York the city goats are said to flourish on the paste-daubed paper of the advertisements, which they nibble from the hoardings. It is beyond doubt that these hardy creatures are exactly suited for living in large towns; an environment of bricks and mortar and paving-stones suits them. Their spirits rise in proportion to what we should deem the depressing nature of their surroundings. They love to be tethered on a common, with scanty grass and a stock of furze-bushes to nibble. A deserted brick-field, with plenty of broken drain-tiles, rubbish-heaps, and weeds, pleases them still better. Almost any kind of food seems to suit them. Not even the pig has so varied a diet as the goat; it consumes and converts into milk not only great quantities of garden stuff which would otherwise be wasted, but also, thanks to its love for eating twigs and shoots, it enjoys the prunings and loppings of bushes and trees. In the Mont d'Or district of France the goats are fed on oatmeal porridge. With this diet, and plenty of salt, the animals are scarcely ever ill, and never suffer from tuberculosis; they will often give ten times their own weight of milk in a year."

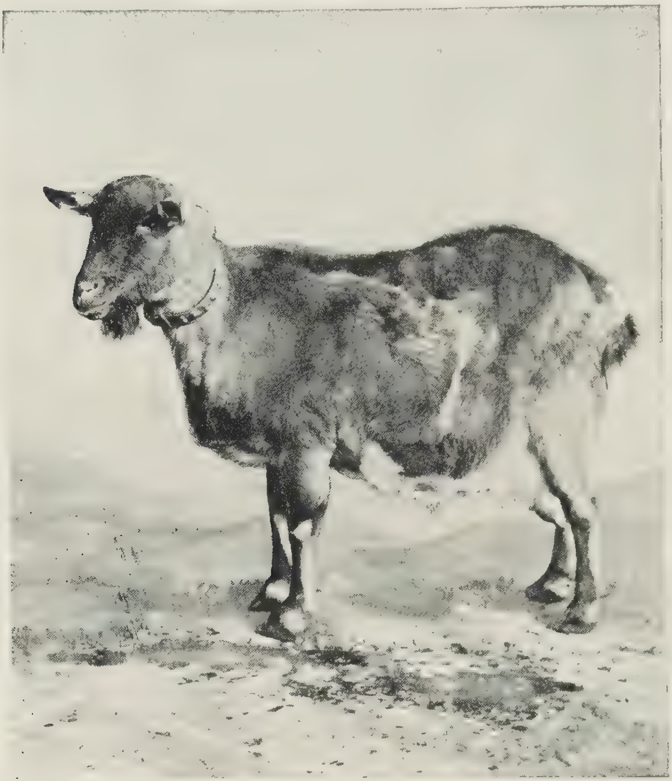


Photo by E. Landor] [*Ealing*

BRITISH GOAT

A much-neglected breed in this country. Note the shape of this animal

The Kashmir shawls are made of the finest goats' hair. Most of this very soft hair is obtained from the under-fur of goats kept in Tibet, and by the Kirghiz in Central Asia. Only a small quantity, averaging 3 ozs., is produced yearly by each animal. The wool is purchased by middlemen, and taken to Kashmir for manufacture.

In India the goat reaches perhaps the highest point of domestication. The flocks are in charge of herd-boys, but the animals are so docile that they are regarded with no hostility by the cultivators of corn and cereals. Tame goats are also kept throughout Africa. The valuable ANGORA breed, from which "mohair" is obtained, is now domesticated in South Africa and in Australia. In the former country it is a great commercial success. The animals were obtained with great difficulty, as the Turkish owners did not wish to sell their best-bred goats; but when once established at the Cape, it was found that they proved better producers of mohair than when in their native province of Angora. The "clip" from their descendants steadily improves.

WILD GOATS

THE TUR

In the Caucasus, both east and west, in the Pyrenees, and on the South Spanish sierras three fine wild goats, with some features not unlike the burhal sheep, are found. They are called TUR by the Caucasian mountaineers. The species found in the East Caucasus differs from that of the west of the range, and both from that of Spain. The EAST CAUCASIAN TUR is a massive, heavy animal, all brown in colour (except on the fronts of the legs, which are blackish), and with horns springing from each side of the skull like half-circles. The males are 38 inches high at the shoulder. The short beard and tail are blackish, and there is no white on the coat. The WEST CAUCASIAN TUR is much lighter in colour than that of the East Caucasus, and the horns point backwards, more like those of the ibex, though set on the skull at a different angle. The SPANISH TUR has the belly and inner sides of the legs white, and a blackish line along the flank, dividing the white from the brown; also a blackish chest, and some grey on the flank.

In the Caucasus the tur are found on the high crags above the snow-line in summer, whence they descend at night to feed on patches of upland grass; but the main home of the tur by day is above the snow-line. The Spanish species modifies its habits according to the ground on which it lives. Mr. E. N. Buxton found it in dense scrub, while on the Andalusian sierras it frequents bare peaks 10,000 feet high. In Spain tur are sometimes seen in flocks of from 100 to 150 each.

THE PERSIAN WILD GOAT

The original of our domesticated goat is thought by some to be the PASANG, or PERSIAN WILD GOAT. It is a fine animal, with large scimitar-shaped horns, curving backwards, flattened laterally, and with knobs on the front edge at irregular intervals. It is more slender in build than the tur, light brown in general colour, marked with a black line

By permission of P. Thomas, Esq.

FEMALE TOGGENBURG GOAT

These goats are milk-goats par excellence; *they remain in profit for at least ten months in the year. Each goat produces on an average from 110 to 120 gallons of milk during the year*

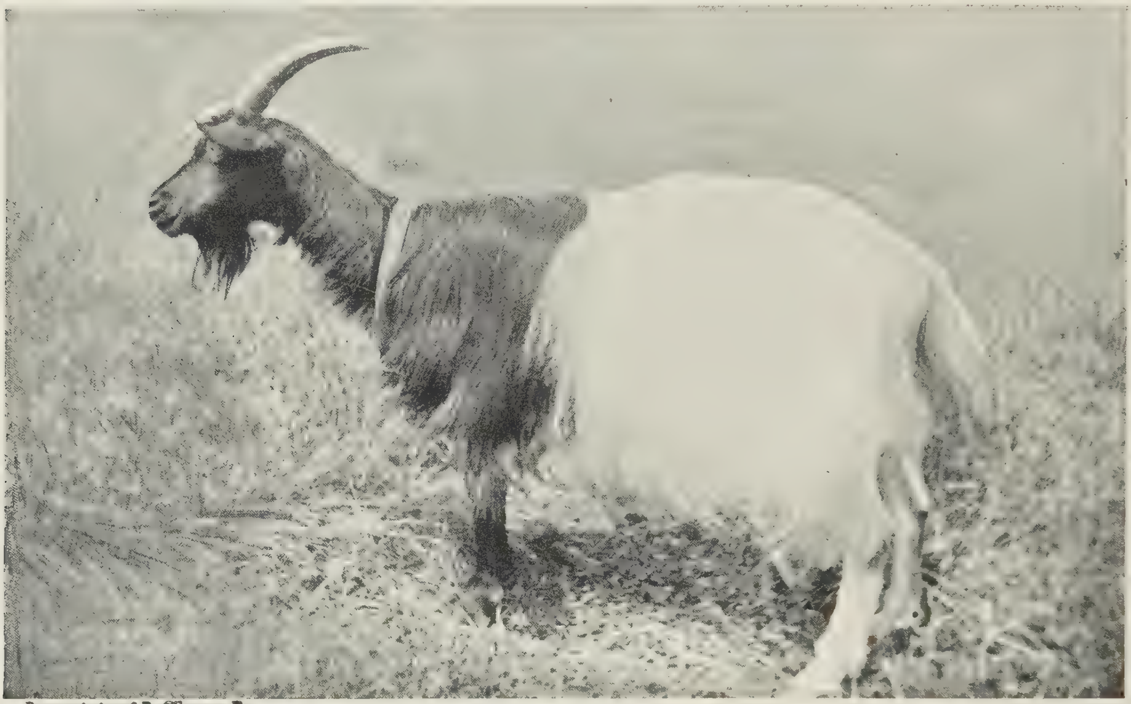
By permission of P. Thomas, Esq.

STUD TOGGENBURG GOAT

This breed originally came from Switzerland, but is now well known in England. The animals are fine in bone, have a long, thin neck, with two tassel-like appendages along the nape and back, black tail, white belly, blackish shoulder-stripe, and a black line dividing the hinder part of the flank from the white belly. Formerly found in the islands of South-eastern Europe, it now inhabits parts of the Caucasus, the Armenian Highlands, Mount Ararat, and the Persian mountains as far east as Baluchistan. A smaller race is found in Sind. It lives in herds, sometimes of considerable size, and frequents not only the high ground, but the mountain forests and scrub, where such cover exists. The domesticated goat of Sweden is said to be certainly a descendant of this species.

The Ibex

Of the Ibex, perhaps the best known of all the wild goats, several species, differing somewhat in size and in the form of their horns, are found in various parts of the Old World. Of these, the Arabian Ibex inhabits the mountains of Southern Arabia, Palestine, and Sinai, Upper Egypt, and perhaps Morocco. The Abyssinian Ibex is found in the high mountains of the country from which it takes its name. The Alpine Ibex is now extinct in the Swiss Alps and Tyrol, but survives on the Piedmontese side of Monte Rosa. The Asiatic Ibex is the finest of the group; its horns have been found to measure $54\frac{3}{4}$ inches along the curve. This ibex inhabits the mountain-ranges of Central Asia, from the Altai to the Himalaya, and the Himalaya as far as the source of the Ganges.



By permission of P. Thomas, Esq.

SCHWARTZALS GOAT

A large, long-haired breed, which derives its name from its peculiar colour, the fore part of the body being black and the hinder part white. These goats are good milkers

The King of Italy is the great preserver of the Alpine Ibex, and has succeeded where the nobles of the Tyrol have failed. The animals are shot by driving them, the drivers being expert mountaineers. The way in which the ibex come down the passes and over the precipices is simply astonishing. One writer lately saw them springing down perpendicular heights of 40 feet, or descending "chimneys" in the mountain-face by simply cannoning off with their feet from side to side. Young ibex can be tamed with ease, the only drawback to their maintenance being the impossibility of confining them. They will spring on to the roof of a house, and spend the day there by preference, though allowed the run of all the premises. The kids are generally two in number; they are born in June.

The ibex was long one of the chief objects of the Alpine hunter. The Emperor Maximilian had a preserve of them in the Tyrol mountains near the Aachen Sea; these he shot with a cross-bow when they were driven down the mountains. Sometimes they were forced across the lake. A picture in his private hunting-book shows the Emperor assisting to catch one in a net from a boat. He notes that he once shot an ibex at a distance of 200 yards with a cross-bow, after one of his companions had missed it with a gun, or "fire-tube." When away on an expedition in Holland, he wrote a letter to the wife of one of the most noted ibex-poachers on his domain, promising her a silk dress if she could induce her husband to let the animals alone. In the Himalaya the chief foes of the ibex are the snow-leopard and wild dog.

THE MARKHOR

The very fine Himalayan goat of this name differs from all other wild species. The horns are spiral, like those of the kudu antelope and Wallachian sheep. It may well be called the king of the wild goats. A buck stands as much as 41 inches at the shoulder, and the maximum measurement of the horns is 63 inches, or over 5 feet! It has a long beard and mane, and stands very upright on its feet. Besides the Himalaya, it haunts the mountains on the Afghan frontier. The markhor keep along the line between the forest and snow, some of the most difficult ground in the hills. The horns are a much-prized trophy.

MALE ALPINE IBEX

The finest wild goat of Europe, formerly common on the Swiss Alps, now only on a limited area on the Italian side

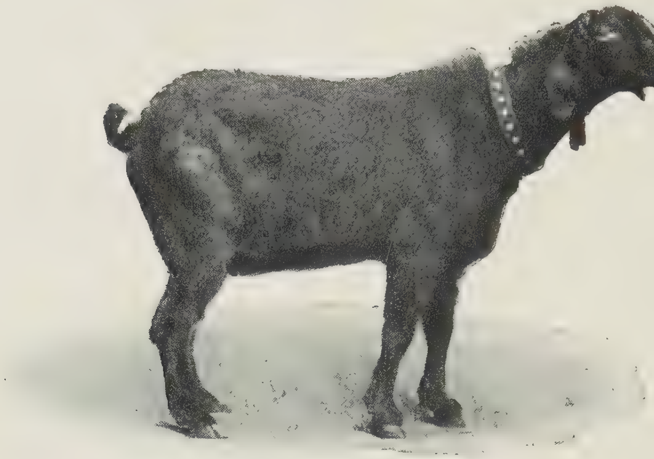
Photo by S. G. Payne, Aylesbury, by permission of the Hon. Walter Rothschild

YOUNG MALE ALPINE IBEX

The photograph shows the corrugated horns of the male

THE TAHR

The TAHR of the Himalaya is a very different-looking animal to the true goats, from which, among other characters, it is distinguished by the form and small size



B. permission of P. Thomas, Esq.

NUBIAN GOAT

These goats come from Nubia and Upper Egypt. They are generally hornless and short-haired; the colour varies, being sometimes black, and sometimes tan and spotted.

of the horns. The horns, which are black, spring in a high backward arch, but the creature has no beard. A buck stands sometimes as much as 38 inches high at the shoulder. It has a long, rough coat, mainly dark stone colour in tint.

Tahr live in the forest districts of the Middle Himalaya, where they are found on very high and difficult ground. General Donald Macintyre shot one standing on the brink of an almost sheer precipice. Down this it fell, and the distance in sheer depth was such that it was difficult to see the body even with glasses. The tahr is fairly common all along the higher Himalayan Range. Its bones are believed to be a sovereign cure for rheumatism, and are exported to India for that object. A smaller kind is found in the mountains of Eastern Arabia, where very few, even sportsmen, have yet attempted to shoot them.

The Nilgiri Tahr, or Nilgiri Ibex

Though not an ibex, the sportsmen of India early gave this name to the tahr of the Nilgiri and Anamalai Hills. The Himalayan species is covered with long, shaggy hair; the South Indian has short, smooth brown hair.

"The ibex," says Hawkeye, the Indian sportsman, of this animal, "is massively formed, with short legs, remarkably strong fetlocks, and a heavy carcase, short and well ribbed up, combining strength and agility wonderful to behold. Its habits are gregarious, and the does are seldom met with separate from the flock or herd, though males often are. The latter assume, as they grow old, a distinctive appearance. The hair on the back becomes lighter, almost white in some cases, causing a kind of saddle to appear; and from that time they become known to the shikaries as the saddle-backs of the herd, an object of ambition to the eyes of the true sportsman. It is a pleasant sight to watch a herd of ibex feeding undisturbed, the kids frisking here and there on pinnacles or ledges of rock and beetling cliffs where there seems scarcely safe hold for anything much larger than a grasshopper, the old mother looking calmly on. Then again, see the caution observed in taking up their resting or abiding-places for the day, where they may be warmed by the sun, listening to the war of many waters, chewing the cud of contentment, and giving themselves up to the full enjoyment of their nomadic life and its romantic haunts. Usually, before reposing, one of their number, generally an old doe, may be observed gazing intently below, apparently scanning every spot in the range of her vision, sometimes for half an hour or more, before she is satisfied that all is well, but, strange to say, seldom or never looking up to the rocks above. Then, being satisfied on the one side, she follows the same process on the other, and eventually lies down calmly, contented with the precautions she has taken. Should the sentinel be joined by another, or her kid come and lie by her, they always lie back to back, in such a manner as to keep a good look-out to either side. A solitary male goes through all this by himself, and wonderfully careful he is; but when with the herd he reposes in security, leaving it to the female to take precautions for their joint safety."

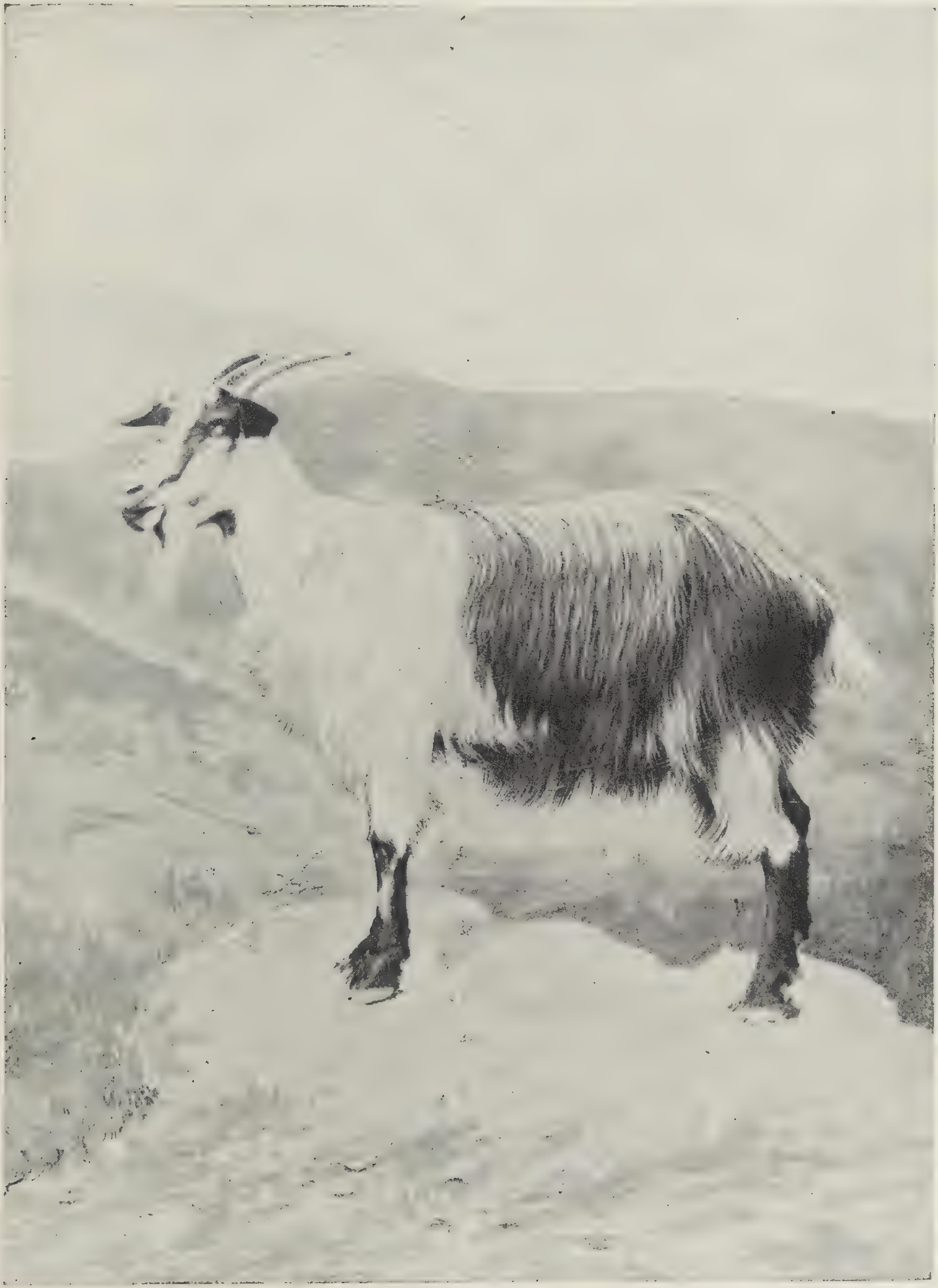


Photo by Fratelli Alinari] [Florence

ITALIAN GOAT

From the earliest Roman days these goats have been the main form of livestock kept by the mountaineers of the Apennines

CHAPTER XV

THE ANTELOPES

BY F. C. SELOUS

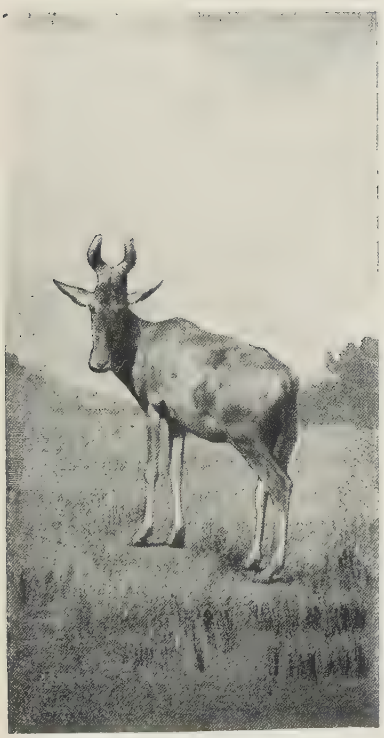


Photo by Miss E. J. Beck

BUBALINE HARTEBEEST

A small species, found in Syria as well as in North Africa

THE TRUE ANTELOPES (including the Gazelles) are strictly confined to the Old World, the Prongbuck of North America differing so much from all other living ruminants, in its horn growth and other particulars, that it is considered to be the sole representative of a distinct family.

THE HARTEBEESTS

With the exception of one species,— the Bubal — which is found both in North Africa and Arabia, the HARTEBEESTS are entirely confined to the African Continent. They are animals of large size, standing from 43 to 48 inches at the shoulder, and are characterised by their long, narrow faces, high withers, and doubly curved horns, which are present in both sexes. Nine different species of this group are known to exist.

Although the ranges of these various species of hartebeest cover the greater part of the African Continent, it is noteworthy that each species keeps to its own ground, their several ranges but rarely overlapping.

All the hartebeests have a strong family resemblance, and are very similar in their habits. They are never found either in dense forests or in swampy or mountainous country, but are inhabitants of the arid deserts of Northern and South-western Africa, and of the open grassy plains and thinly forested regions of the high plateaux of the interior of that continent. They are extraordinarily fleet and enduring, and in my own experience I have never heard of one of these animals, of whatever species, having been overtaken or ridden to a standstill by a man on horseback. They are very inquisitive, and where they have not been molested will allow any unaccustomed object — such as a European in clothes — to walk to within easy shot of them before running off. They soon gain experience, however; and in countries where they have been most persecuted hartebeests are the keenest-sighted and the most wary of all African game. They are very fond of climbing to the top of the large ant-heaps with which the plains of Africa are profusely studded, and from this point of vantage surveying the surrounding country. They live, I believe, entirely upon grass, and in the desert areas of their range seem able to subsist for long periods without drinking water. Their meat I have always thought very palatable. They are generally in fairly good condition, though they seldom carry much fat. Their fat, after being melted, becomes solid again immediately on cooling, and clogs on the teeth whilst being eaten. But very few African species, except the eland, ever become really fat; their life is too active, and the food-supply too uncertain, for them to put on flesh like European deer.

Photo by Percy Ashenden] [*Cape Town*

BLESBOK

A species formerly very numerous in South Africa, but now well-nigh exterminated

Bontebok and Blesbok Group

Nearly allied to the hartebeests are certain other antelopes of which it will be sufficient to mention but two species — *viz.* the Bontebok and the Blesbok. These two antelopes, though doubtless distinct, since their points of difference are constant and unvarying, are nevertheless so much alike, and evidently so closely allied, that I look upon the former as a highly coloured and specialised race of the latter. The blesbok once had a far wider range than the bontebok, and ran in countless herds on the plains of the northern districts of the Cape Colony, the Orange River Colony, the Transvaal, Griqualand West, and British Bechuanaland, whilst the latter animal has always been confined to the sandy wastes in the neighbourhood of Cape Agulhas, the extreme southern point of Africa.

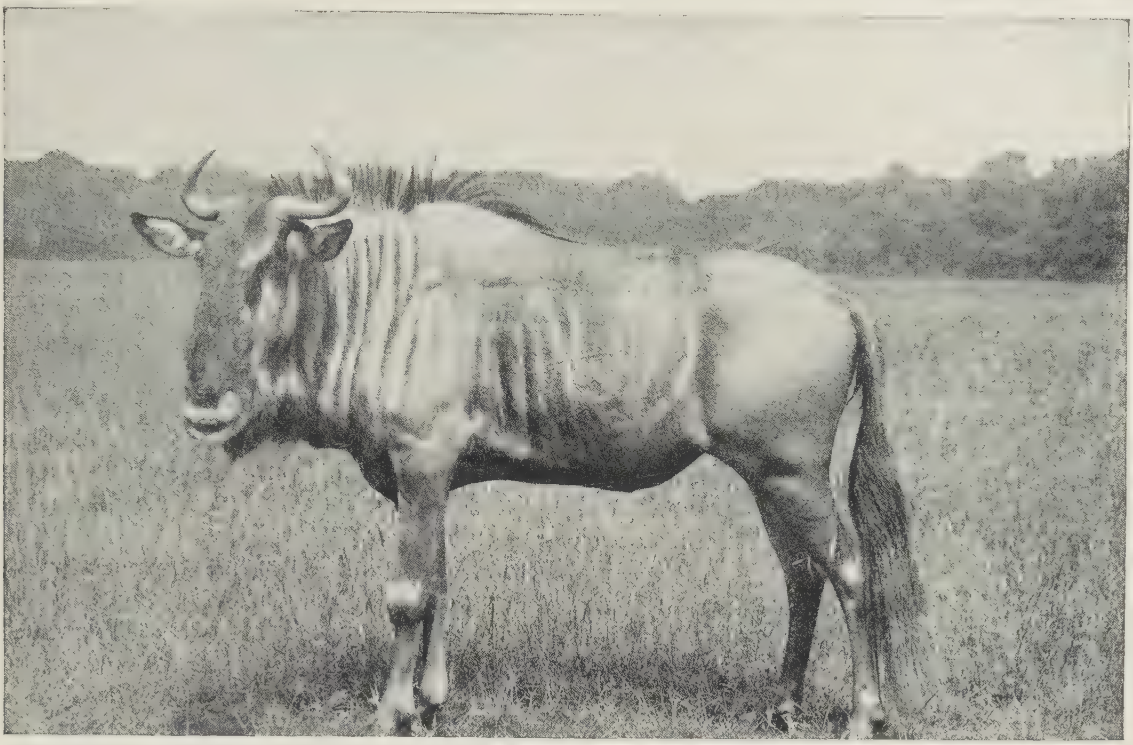
I think it, however, not improbable that ages ago the blesbok ranged right through Cape Colony to the sea-shore, and that subsequently the gradual desiccation of the south-western portions of the country — which is still continuing — or several years of continuous drought, caused the withdrawal of the species northwards from the waterless parts of the country. Those, however, which had reached the neighbourhood of Cape Agulhas, where there is plenty of water, would have remained behind and formed an isolated race, which, being influenced by local conditions, would naturally in course of time have become differentiated from the parent stock. Be this as it may, the bontebok of to-day is nothing but a glorified blesbok, being slightly larger and more richly coloured than the latter animal. Its horns, too, are always black, whilst those of the blesbok are of a greenish hue. When they are in good condition, the coats of both these species of antelope, as well as of the Sassaby, another member of this group, show a beautiful satiny sheen, which plays over their purple-brown hides like shadows on sunlit water.

The few bonteboks which still survive are now all preserved on large enclosed farms; but their numbers are very small — less than 300, it is believed. The farmers of Dutch descent now do their best to preserve rare species on their land.

Photo by J. W. McLellan] [*Highbury*

WHITE-TAILED GNU AND CALF

This "Wildebeest" is believed to be practically exterminated as a wild anima



A COW BRINDLED GNU

This gnu, which is still found in great numbers in East Central Africa, indulges in the same curious antics as the white-tailed species

THE GNUS

These remarkable animals were once distributed throughout the greater part of Africa from the Cape to Abyssinia, and their range is even now very extensive, though what was once the most numerous and the most eccentric-looking species of the group has almost ceased to exist.

The gnus are of large size, and at first sight appear to have the head of a buffalo, the tail of a horse, and the limbs and hoofs of an antelope. Their heads are very massive, with broad muzzles and widely separated, hairy nostrils; their necks are maned, tails long and bushy, and both sexes carry horns. They are known as "wilde beeste," or "wild cattle," to the Dutch colonists of South Africa.

The WHITE-TAILED GNU, or BLACK WILDEBEEST, as it is more commonly called, was once found in great numbers on the karroos of Northern Cape Colony, and throughout the vast plains of the Orange River Colony, Transvaal, Griqualand West, and British Bechuanaland. Its range, in fact, was coequal with that of the blesbok. Even as lately as in 1875 and 1876 I personally saw very considerable herds of these quaint animals in the Orange River Colony and the Western Transvaal. When the present war broke out in 1899, there were only two herds of black wildebeest left alive. These animals numbered some 500 head altogether, and were protected by Dutch farmers. There

Photo by Miss E. J. Beck

RED-FLANKED DUIKER

The duikers are for the most part diminutive and graceful antelopes, with simple, spike-like horns are probably very few of them left to-day, and it is scarcely possible that this most interesting animal will long escape complete extinction.

Black wildebeests, before they had been much persecuted, were so inquisitive that, in the words of Gordon Cumming, they would "caper and gambol" round a hunter's waggon or any other unusual object, and sometimes approach to within a couple of hundred yards, when, whisking their long white tails, they would gallop off with loud snorts. They were always, however, very keen-sighted, and soon became extremely wary and almost impossible to approach on foot in the open plains they frequented, whilst their powers of endurance and fleetness of foot were such that they could only be overtaken by a well-mounted hunter. In spite of these advantages, however, the value of their skins, and the ever-increasing number of hunters, armed with long-range rifles, practically brought about the extermination of this species of gnu in a few decades.

The BRINDLED GNU is a larger animal than the last-named species, standing 4½ feet and upwards at the shoulder. This animal once ranged from the Vaal River northwards, throughout Eastern and Central Africa, to the north of Kilimanjaro, where its range overlaps that of a closely allied form, the WHITE-BEARDED GNU, which is only found in certain districts of Eastern Africa. In general habits these two varieties seem to be identical.

In the interior of Southern Africa, both north and south of the Zambesi, I have met with very large numbers of BLUE WILDEBEESTS. They usually run in herds of from ten to twenty individuals, but towards the end of the dry season collect in droves of 200 or 300. They are often found in company with zebras and sassaby antelopes. Their flesh resembles coarse beef, and, to my thinking, is not ill-flavoured.

THE SMALLER BUCKS

In addition to the great number of antelopes of large size which inhabit the African Continent, there are also very many small species, the life history and habits of some of which are as yet but imperfectly known, since they are denizens of dense forests, and feed principally at night.

All these small African antelopes are divided into two sub-families. The first comprises the African DUIKERS and the Indian FOUR-HORNED ANTELOPE, and the second the DIK-DIKS, ORIBIS, KLIPSPRINGER, and certain other small bush-antelopes.

The African duikers are distributed throughout Africa south of the Sahara, and are represented by some twenty different species, the largest of which approaches a small donkey in size, whilst the smallest is not much larger than a hare.

The majority of these dainty little antelopes are inhabitants of the dense tangled forests of the coast-belts of Africa, and are therefore but seldom seen by travellers and sportsmen. One species of the group however, the COMMON DUIKER of South Africa, is a very well-known animal. This little antelope inhabits much more open country than most of its congeners, and has an enormous range, extending from Cape Agulhas to Somaliland, whilst

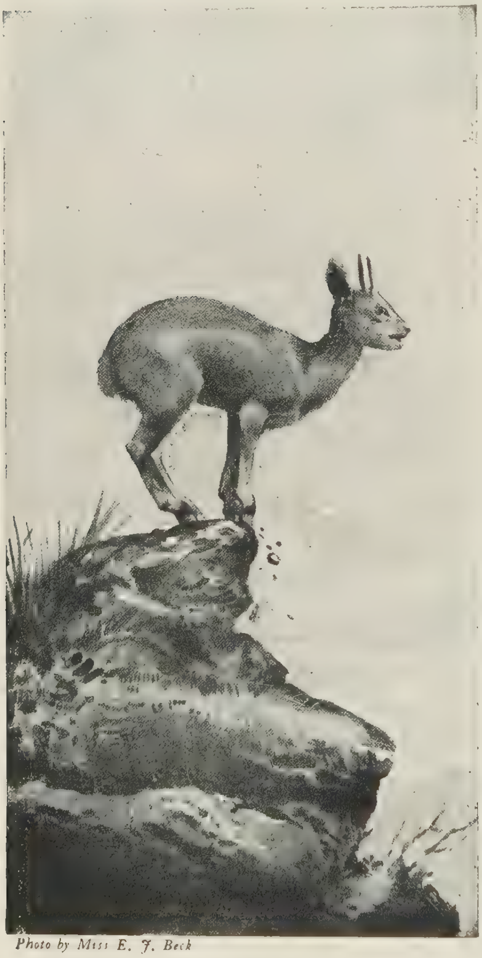


Photo by Miss E. J. Beck

KLIPSPRINGER

The "cliff-jumper" is as active in its habits as a chamois, and is found in most of the mountain-ranges of Africa

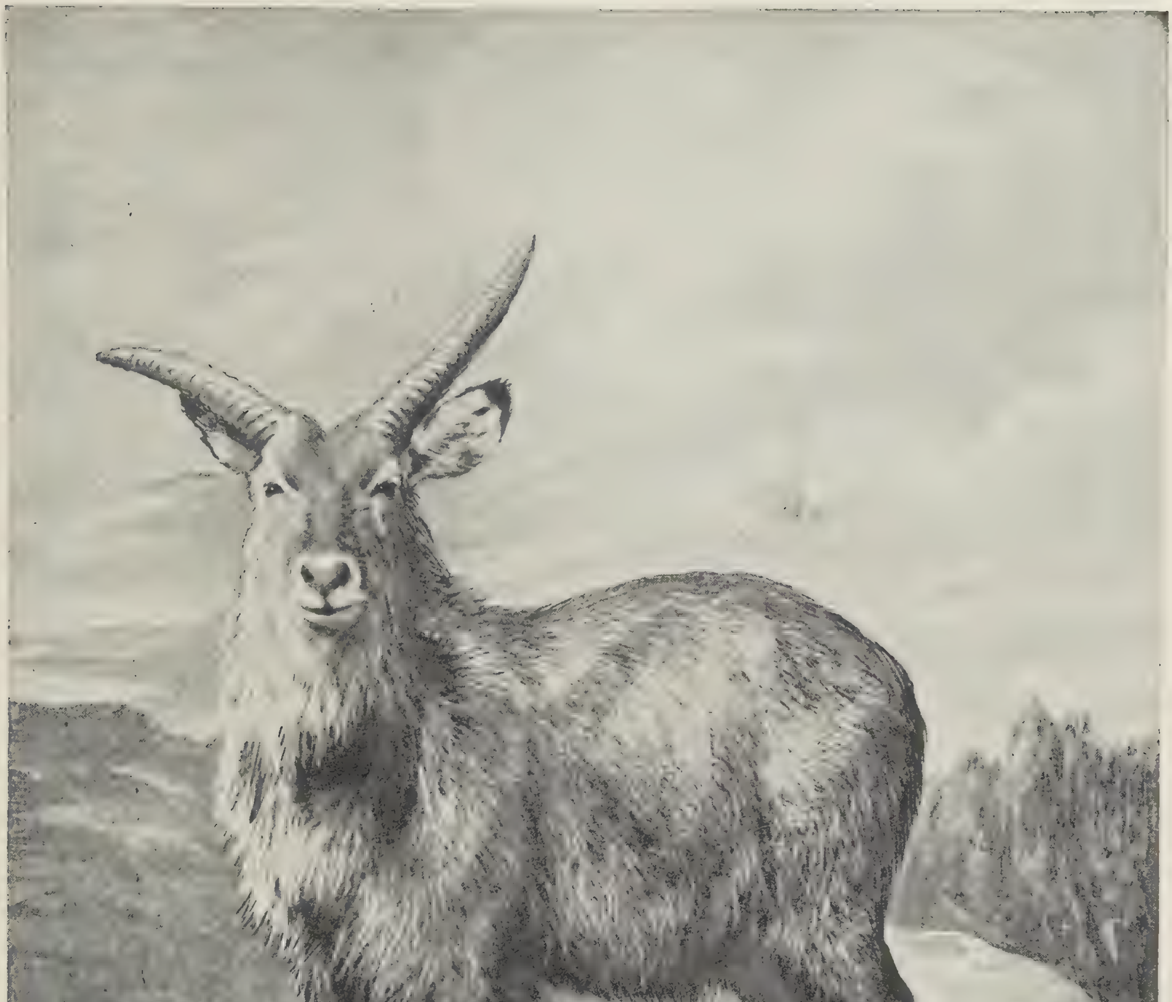


Photo by G. W. Wilson & Co., Ltd.]

SING-SING WATERBUCK

The sing-sing and its relatives differ from the true waterbuck by the absence of the white elliptical ring on the rump

Photo by W. P. Dando]

MOUNTAIN REEDBUCK

One of a group of small antelopes still common in many parts of Africa

two very nearly allied forms are found in Senegal and Abyssinia respectively.

In most species of duikers both sexes are horned, but in the case of the common duiker it is very exceptional to find a female with horns, and in all my experience I have only known of three such cases.

The FOUR-HORNED ANTELOPE is the Indian representative of the African duikers, and is found along the foot of the Himalaya from the Punjab to Nepal, and in suitable localities throughout the peninsula of India. It frequents wooded hills, but avoids dense jungle. Like its nearest allies, the duikers, it is solitary in its habits, more than two of these antelopes seldom being seen together. The growth of four horns on the skull of this antelope and on certain breeds of domesticated sheep is a curious fact which has not roused as much comment as it deserves.

THE KLIPSPRINGER

Turning to the second sub-family, we may select the KLIPSPRINGER as the most characteristic species to describe. This beautiful little animal, which is often called the African Chamois, is found in suitable localities from the Cape to Abyssinia. In the southern and northern portions of its range the klipspringer is an inhabitant only of rugged mountain-ranges, and ascends to a height of 9,000 or 10,000 feet above sea-level. In the more central regions of its habitat, however, although it always lives amongst rocks, and thoroughly justifies its name of "rock-jumper," it is often found in regions where there are no high mountain-ranges. It used to be very common in Matabililand, both in the Matopo Hills and on the isolated granite kopjes which are so numerous in that country, and usually are not more than 200 or 300 feet in height. In Mashonaland I have found it living amongst granite rocks in the beds of the larger rivers, and actually on the same level as the surrounding country; whereas on Wedza, a great mountain-mass of slate and ironstone, which rises to a height of about 2,000 feet above the surrounding country, and to the top of which I once climbed, I did not see any klipspringers. The hoofs of this little animal are curiously different from those of any other African antelope, being remarkably short and small, with very deep hollows. This adaptation to its requirements enables the klipspringer to obtain a foothold on any small

Photo by S. G. Payne, Aylesbury, by permission of the Hon. Walter Rothschild

MALE IMPALA, OR PALLA

The beautifully curved horns of the male palla form some of the most graceful of trophies projecting piece of rock, and to climb in a series of little jumps up the faces of cliffs which seem almost perpendicular.

In height the klipspringer stands about 1 foot 9 inches at the shoulder. The males alone carry horns, which are straight and ringed at the base, and vary from 3 to 5 inches in length. The coat is of a greeny yellow-brown colour, with the hairs hollow and brittle. These little animals are usually met with singly, or in twos and threes together. When caught young, they become wonderfully tame, and make the most charming pets, being very playful and fond of jumping, with surprising ease and grace, from the floor of a room on to any elevated position, such as a table, mantelpiece, or window-sill.

The Waterbucks

The largest animals in the first of three groups now to be considered are the Waterbucks, antelopes of stout and sturdy build, standing from 45 to 50 inches at the shoulder, and covered with long, coarse hair, especially on the neck, in both sexes. The males alone carry horns, which vary from 20 to 36 inches in length, and are strongly ringed in front for three-fourths of their length. They are sublyrate in shape, being first inclined backwards and then forwards at the tips. There are three well-marked species of waterbuck — *viz.* the Common Waterbuck of South Africa, whose range extends from the Limpopo northwards, through Nyasaland to German and British East Africa, and to the Shebeyli River, in Somaliland; the Sing-sing of Senegal and Gambia; and the Defassa Waterbuck of Western Abyssinia and the Nile Valley, south to Uganda and British and German East Africa. In habits all species of waterbuck are very similar. They live generally, though not invariably, in herds of from ten to twenty individuals, and in such small herds there is seldom more than one full-grown male present. In the interior of South Africa the waterbuck is often met with amongst steep stony hills and at a distance of more than a mile from the nearest river. Speaking generally, however, this antelope may be said to frequent the near neighbourhood of water, but to prefer dry to swampy ground. When chased by dogs it always makes for water, and will plunge fearlessly into broad, deep rivers, regardless of crocodiles, to which ravenous reptiles it sometimes falls a victim. In South Africa waterbuck vary much in colour even in the same district, some being reddish brown, whilst others are of a very dark grey. The flesh of the waterbuck is coarse, and sometimes rather strongly tasted, and when in good condition the fat is very hard.

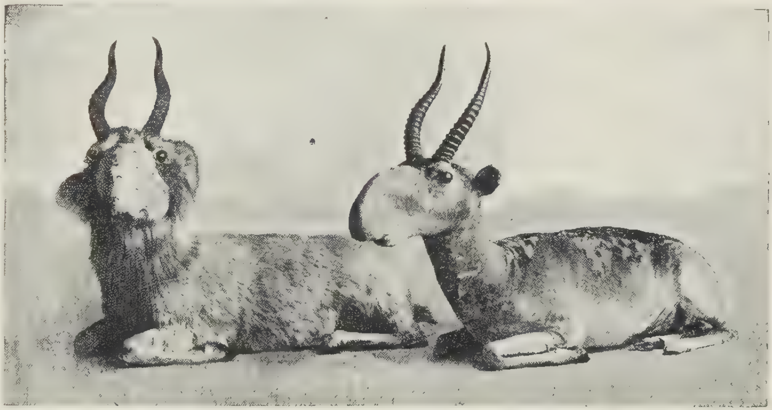


Photo by S. G. Payne, Aylesbury, by permission of the Hon. Walter Rothschild

MALE SAIGA ANTELOPES

These antelopes inhabit the East Russian steppes. The thick woolly coat turns nearly white in winter

The Reedbucks are similar in essential characters to the waterbucks, but are of smaller size, and have more bushy tails, and naked spots on the sides of the head beneath the ears.

Of this group the Common Reedbuck of South Africa is the best known. This animal stands 3 feet at the withers, and is of a soft greyish fawn-colour, with a large fluffy tail, which is always thrown up when the animal runs, exposing the white under-surface. The males alone carry horns, which curve backwards and then forwards, and attain a length of from 12 to 16 inches. Reedbucks are met with singly or in twos and threes, and never congregate in herds.

though I have seen as many as eight, belonging probably to three or four families, feeding in close proximity to one another on young green grass.

Another member of the reedbuck group is the ROOI RHEBUCK of South Africa. This latter species, though a much smaller animal, is very similar to the common reedbuck in colour, shape, and general appearance; it is quite distinct in its habits and mode of life, as it lives in small herds of from four or five to fifteen head, amongst rugged stony hills, often far from water.

THE BLACKBUCK OF INDIA

This handsome species is found throughout India wherever there are open cultivated plains. The male stands about 32 inches at the shoulder, and when full grown is of a glossy black colour, with the exception of a chestnut-coloured patch at the back of the neck, and some markings of the same colour about the face. The belly and insides of the limbs are pure white, the line between the black and white being very clearly defined. The whole body and frame are very compact, strong, and beautifully proportioned, and the head is carried high. The males alone carry horns, which are spiral in shape, annulated almost to the tips, and vary in length from 18 to 28 inches. Young bucks and does are fawn-coloured instead of black. These antelopes are usually met with in considerable herds on open plains in which cultivated tracts alternate with waste land, and they often do much damage to the natives' crops. When alarmed, they first execute a series of prodigious bounds into the air before finally settling down to a steady run. They are surprisingly fleet, and can seldom be overtaken by the fastest greyhounds, although they can be caught and pulled down without difficulty by trained cheetas, or, as they are often called, hunting-leopards.

Photo by Miss E. J. Beck

ARABIAN GAZELLE

Gazelles are some of the most slenderly built of all antelopes

The PALLA, which is found in Southern and Eastern Africa from Bechuanaland to Kordofan, is one of the most graceful of animals. It is a forest-loving species, and is never found far from water. Both sexes are of a general bright reddish brown, with white bellies. The males alone carry horns, which are very graceful in shape, and vary from 14 to upwards of 20 inches in length. The finest specimens of the palla are met with in the extreme southerly and most northerly portions of its range, the animals inhabiting the intermediate districts being smaller and carrying shorter horns. Pallas are gregarious, living in herds of from twenty to over one hundred. When alarmed, they bound over bushes or any other obstacles with the utmost ease and grace, and appear to get over the ground at a high rate of speed. They are, however, very commonly run down and torn to pieces by wild dogs, which hunt in packs, and are very destructive to African game.

Of far less graceful appearance than the two preceding species is the SAIGA, which, though structurally closely allied to the gazelles, has been placed by naturalists in a genus by itself.

This curious-looking animal, which is chiefly remarkable for its large swollen-looking nose and light-coloured horns, is an inhabitant of the steppes of the South-eastern Europe and Western Asia. In height it stands about 30 inches at the withers, and is of a dull yellowish colour in summer, turning to nearly white in winter. The males alone carry horns, which are sometimes 13 or 14 inches long, and of a peculiar colour which has been likened to pale amber, At the present day the saiga is only found in Europe on the plains between the Don and the Volga, but to the east of the Ural River its range extends over the Kirghiz Steppes and the high plains of all Western Siberia. Living in open country, and having the senses of hearing, sight, and scent all highly developed, the saiga is a difficult animal to approach, and can only be successfully stalked by an expert hunter. In summer it is usually met with in small, scattered bands, which, when driven southwards by snow and cold, are collected into considerable herds in the more southerly portions of its range. In very severe winters whole herds have been known to perish in snow-drifts, and in such inclement seasons large numbers are also killed by the natives. The flesh of the saiga is said to resemble mutton, and is held in much esteem.

The Gazelles

We now come to the Gazelles, among which are comprised many of the best known and most beautiful of the small or medium-sized antelopes. In the true gazelles both sexes generally carry horns. Indeed, this rule is universal in those of Africa and Arabia; and there are only four species known — all Asiatic — in which the females are hornless: *viz.* the TIBETAN GAZELLE, PREJEVALSKI'S GAZELLE, the MONGOLIAN GAZELLE, and the PERSIAN GAZELLE.

By permission of Herr Carl Hagenbeck] [*Hamburg*

GOITRED GAZELLES FROM MESOPOTAMIA

These animals are inhabitants of rocky and desert ground. They are often kept tame by the wandering Arabs

The range of the various species belonging to this large group is very extensive, comprising the whole of Northern and Eastern Africa, Arabia, and Western and Central Asia, as well as Mongolia and India. The gazelles are inhabitants of the open plains and arid desert regions of the Old World, and, although sometimes met with in tracts of country where there is a certain amount of scattered bush or open stunted forest, are never found in any kind of jungle or thick cover.

On the sandy plains of North-western Africa are found the RED-FRONTED GAZELLE of Senegal and Gambia; the little-known MHORR GAZELLE of South-western Morocco; and the DAMA GAZELLE, a species which has been known to naturalists ever since the time of Buffon. A near ally of the last-named animal is the RED-NECKED GAZELLE of Dongola and Senaar. In North-eastern Africa are found the large and handsome SOEMMERRING'S GAZELLE; the ISABELLA GAZELLE, of the coastlands of the Red Sea; HEUGLIN'S GAZELLE; PELZELN'S GAZELLE, of the maritime plains of Northern Somaliland; and SPEKE'S GAZELLE, of the interior of the same country; whilst farther south the group is represented by the large and beautiful GRANT'S

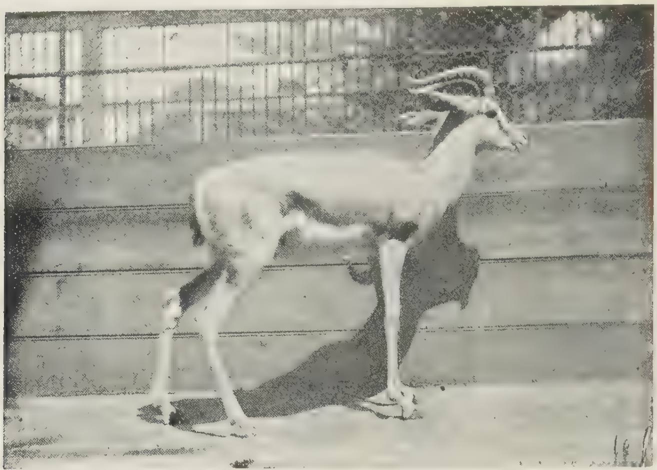


Photo by L. Medland, F.Z.S.] [North Finchley

SPEKE'S GAZELLE

Found in the interior of Northern Somaliland

GAZELLE, with its allies PETERS'S GAZELLE and THOMSON'S GAZELLE. The well-known DORCAS GAZELLE is an inhabitant of Morocco and Algeria, ranging through Egypt into Palestine and Syria; the MARICA GAZELLE, the MUSCAT GAZELLE, and the ARABIAN GAZELLE inhabit the deserts of Arabia; the EDMI GAZELLE is found in the mountain-ranges of Morocco, Algeria, and Tunis; while LODER'S GAZELLE inhabits the sandy tracts of the interior of Algeria and Tunis. In Asia, besides the four species of gazelle already enumerated in which the females are hornless, one other member of the group is met with. This is the INDIAN GAZELLE, a species very closely allied to the Arabian form.

Of the whole genus GRANT'S GAZELLE is the most beautiful. This handsome animal, which was first discovered by the explorers Speke and Grant in 1860, is an inhabitant of Eastern Africa, from the neighbourhood of Lake Rudolph southwards to Ugogo. In size the average height at the shoulder of males of this species is about 34 inches. The coat is close and short and of a general fawn colour, the rump and belly pure white, and the face marked with a rufous band from the horns to the nose and with streaks of white on each side. The upper surface of the tail is white, with a black and tufted tip. The horns, which are very elegant in shape, being first curved slightly forwards and then backwards, are much longer and more powerful than in any other gazelle, and attain a length of 30 inches in the males and 17 inches in the females.

Grant's gazelles, though they undoubtedly find their most congenial home in open country, have also been met with by recent travellers in bush-sprinkled wastes and stony, rugged hills. They are, however, never found in dense jungles or high mountains. They live in herds of from half a dozen to twenty or thirty individuals, though in certain localities as many as 200 have been seen together. They are fond of consorting with other game, such as Burchell's and Grevy's zebras, Coke's hartebeest, and the beisa oryx, and are often met with at long distances from the nearest water. They are keen-sighted and wary, and from the open character of the country in which they are usually encountered are often difficult to stalk. When in good condition, the meat of this gazelle is said to be excellent.

The nearest ally of the true gazelles is undoubtedly the SPRINGBUCK of South Africa. Owing to the protection which it has received of late years, this graceful antelope is now a common animal in many parts of South Africa, and in the north-western portions of the Cape Colony still sometimes collects into prodigious herds, which travel through the country in dense masses, destroying every vestige of grass on the

Photo by W. P. Dando]

GAZELLES FROM EGYPT

Seen in great numbers in the Bayuda Desert line of their advance, and causing considerable anxiety to farmers, whose flocks of sheep and goats are sometimes swept away by the migrating springbucks. In former years the migration of these antelopes in countless thousands from the deserts of Namaqualand to the countries farther south was a common occurrence, an unerring instinct guiding the wandering herds to districts where rain had lately fallen and caused a new growth of green grass. The animals composing these migrating herds were called by the Dutch settlers of the Cape Colony "Trekbokken," or "travelling-bucks."

Two other antelopes, the DIBATAG and the GERENUK, are included in the present group; but both, whilst typically gazelline in certain respects, differ so much in other ways from all members of that group that each has been placed in a separate genus.

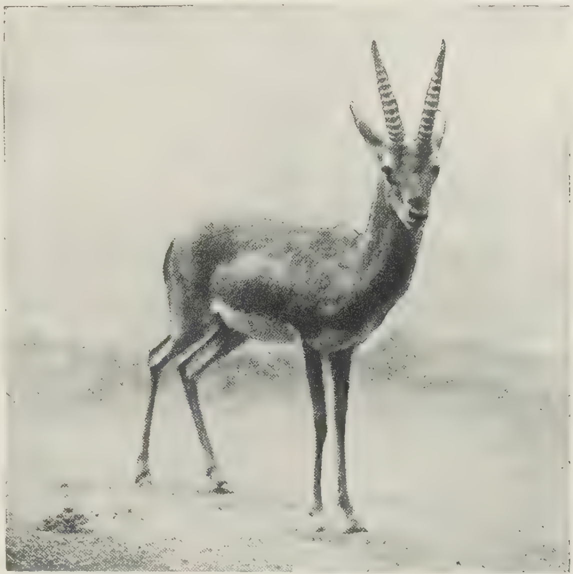


Photo by W. P. Dando] [*Regent's Park*

RED-FRONTED GAZELLE

Inhabits Dongola and Senaar

The DIBATAG is a very remarkable-looking antelope, only found in certain districts of Central Somaliland, where it was first discovered by Mr. T. W. H. Clarke in 1890. This species shows the face-markings of the gazelles, whilst the horns, which are only present in the males, much resemble in shape those of a reedbuck. They are rather short, attaining a length of only 11 or 12 inches, and their basal halves are strongly ringed in front. The neck of this antelope is singularly long and thin, and the tail, which is held curved forwards over the back when the animal is in motion, is also much elongated, and only tufted at the tip. The dibatag frequents sandy ground sparsely covered with low thorn-bushes, and lives in small families, being usually met with in twos or threes, whilst it is rare to find more than four or five consorting together.

Photo by W. P. Dando] [*Regent's Park*

RED-FRONTED GAZELLE

Another view of the specimen shown above

The GERENUK, like the last-named animal, is an East African species, but has a more extended range, being found all over Somaliland, and thence southwards to the Tana Valley and the Kilimanjaro district of British East Africa. The most remarkable external characteristic of this species is the excessively long neck. The males alone carry horns, which attain an average length of 12 or 13 inches, and, though somewhat gazelle-like in shape, are more strongly crooked forwards at the points. The skull of this species is more dense and solid in structure than in the true gazelles, and the cheek-teeth are smaller in size.

Coming now to the Sable Antelope group, we find an assemblage of antelopes which are all of large size and handsome appearance, and in all of which both the

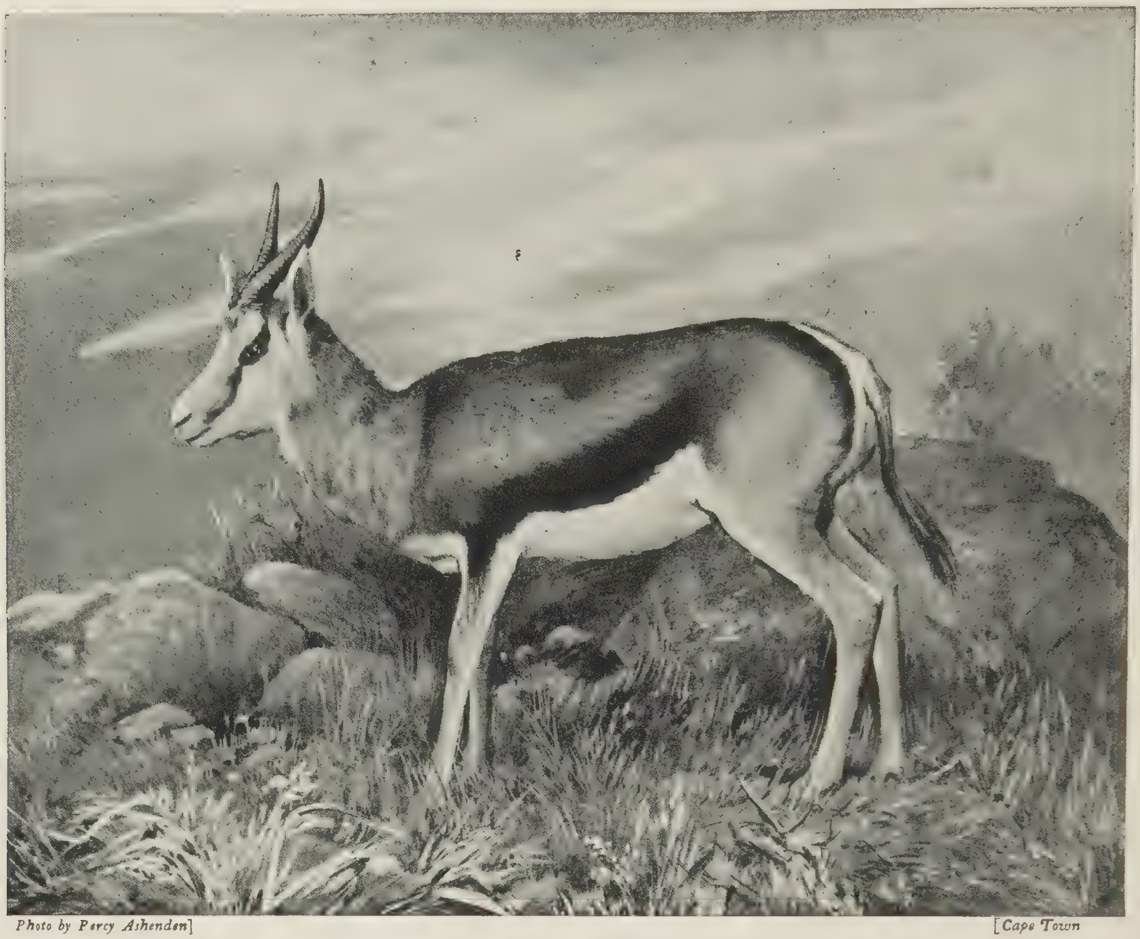


Photo by Percy Ashenden] [*Cape Town*

MALE SPRINGBUCK

Once the most numerous species in South Africa, where it is still not uncommon. Its migrations, or "treks," at certain seasons were one of the sights of the veldt

males and females are horned. With the single exception of the BEATRIX ORYX, which inhabits Arabia, all these antelopes are denizens of Africa. One species of the group, the BLUEBUCK, which appears to have been entirely confined to the mountainous districts of the Cape Peninsula, became extinct during the first decade of the last century. Little is known as to the life history of this animal, but it was undoubtedly nearly allied to the larger and more handsomely marked ROAN ANTELOPE. This latter animal once had a more extensive range than any other antelope, as it was found in almost every part of Africa south of the Sahara, with the exception of the Congo forest region. It has now been exterminated in the more southerly portions of the country, but from the Limpopo to the Upper Nile, and thence to the Niger, it is still to be found wherever the surroundings are suitable to its requirements.

A large bull roan antelope will stand 4 feet 9 inches at the withers. The general colour of the body differs in individuals, even in the same district, varying from a very light shade of brown to dark grey or red-roan. The front and sides of the face are jet-black in the adult male, and dark reddish brown in the female, with two long white tufts of hair under the eyes. The muzzle and extremity of the lower jaw are white. The hair on the under side of the neck is long and coarse, and a stiff mane about 3 inches in length runs from behind the ears to the withers. The ears are very long, and in the females and young males tufted. The horns are curved backwards, and in the male are very stout and strong, attaining a length of from 26 to 34 inches. In the female the horns are shorter and slighter, and not so strongly ringed.

Roan antelope are usually met with in small herds of from six to a dozen members, and never congregate in large numbers. I do not think I have ever counted as many as thirty together. I have found them fairly common in certain districts, but nowhere very plentiful. They frequent open plains and thinly forested country, and are never found far away from water. Bucks often become savage when wounded, and will sometimes charge viciously if approached incautiously. They can use their horns with great dexterity, and play havoc with a pack of dogs.

The SABLE ANTELOPE, though considerably smaller than the roan, is yet a handsomer animal. In colour the adult male, when in high condition, is jet-black all over with the exception of the white face-markings and the snow-white of the belly and insides of the thighs. The mane is longer and more bushy than in the roan antelope, and often hangs down on either side over the withers. The horns, too, are much finer, and, sweeping backwards in a bold curve, are commonly upwards of 42 inches long, and have been known to reach 50 inches. The striking colour, large size, and horns of this creature make it one of the most-prized trophies of the sportsman. The skin, when prepared and laid down as a rug in halls or dwelling-rooms, is far more handsome than that of any deer. The female of this species is usually of a rich red-brown in colour instead of black as in the male. South of the Zambesi, however, old cows become almost absolutely black. North of the Zambesi both male and female sable antelopes are dark red in colour rather than black. The horns in the female are slighter and less curved than in the male, and are also considerably shorter, as a rule not measuring over 30 inches in length.

The range of the sable antelope extends from the northern districts of the Transvaal to German East Africa. In the country between the Limpopo and the Central Zambesi it used to be a very common animal, especially in the northern districts of Mashonaland. It is partial to open forests intersected by grassy, well-watered glades, and is never found on open plains entirely devoid of bush. It is usually met with in herds of from twelve to twenty individuals, but I have often seen as many as fifty, and once

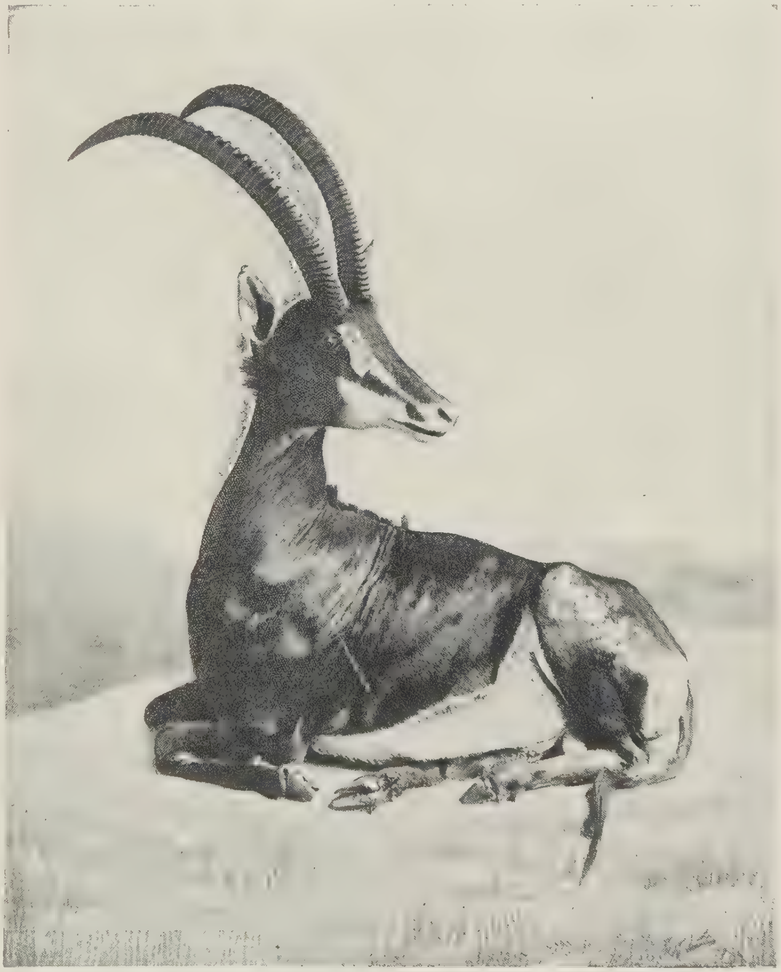


Photo by S. G. Payne, Aylesbury, by permission of the Hon. Walter Rothschild

SABLE ANTELOPE

A near ally of the Roan Antelope, from which it is broadly distinguished by its striking coloration — black and white

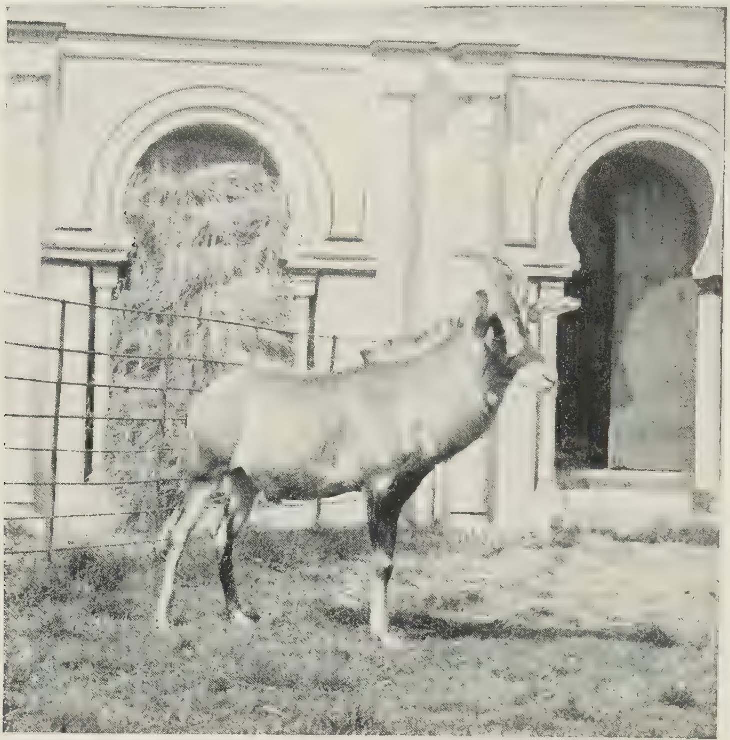


Photo by the Duchess of Bedford]

ROAN ANTELOPE

In common with the Sable Antelope and the Oryx group, both sexes of this species carry horns

counted between seventy and eighty together. However large a herd of sable antelopes may be, it is very exceptional to find with it more than one fully adult male, from which fact I should judge that these animals are of a very jealous and pugnacious disposition. When wounded and brought to bay by dogs, a sable antelope defends itself with the utmost fury, using its long scimitar-shaped horns with most wonderful quickness and dexterity. If badly wounded it will lie down, otherwise it fights standing. Keeping its face to some of its foes, with a sideways twist of its head it will transfix and throw into the air any dog which attempts to attack it from behind. I have seen a wounded sable antelope, when lying down, drive one of its horns clean through a large dog deep into its own haunch, and I have had four valuable hounds killed and four others grievously wounded by one of these animals in less than a minute. I once knew a native hunter who was stabbed through the kidneys and killed by a sable antelope cow.

The nearest allies of the sable and roan antelopes are the various species of the genus Oryx. In this group are included the WHITE ORYX, which inhabits the desert regions of the interior of Northern Africa from Dongola to Senegal; the BEATRIX ORYX of Southern Arabia; the GEMSBUCK of South-western Africa; the BEISA, which is found in North-east Africa from Suakim southwards to the river Tana; and the TUFTED BEISA, which is

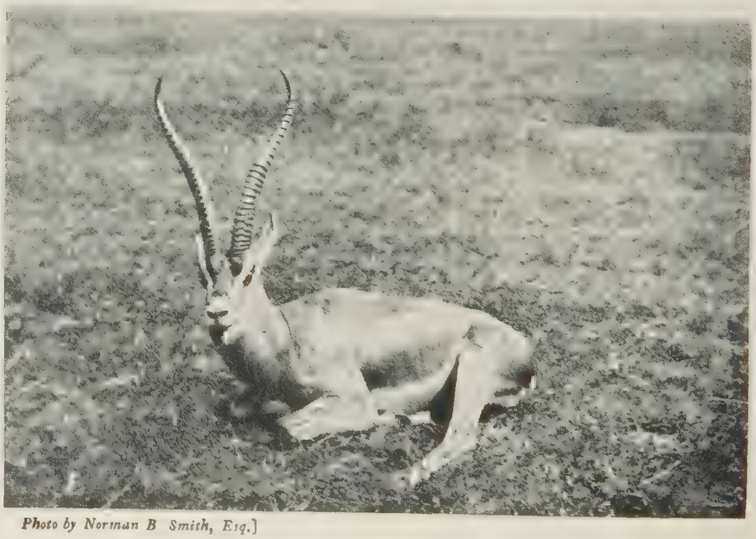
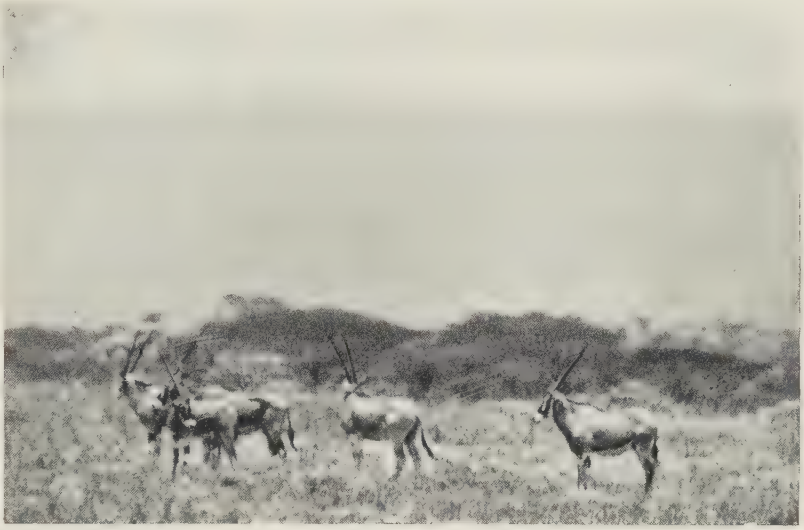


Photo by Norman B Smith, Esq.]

MALE OF GRANT'S GAZELLE

This fine East African species is one of the handsomest of its kind very nearly related to the last-named species, whose place it takes south of the Tana River in certain districts of British and German East Africa. In general appearance there is a strong family resemblance between the different species of oryx. In all of them both sexes carry horns, which are considerably longer, though somewhat slighter, in the females than in the males. In the white oryx the horns are curved backwards; but in the other four species they are straight, or nearly so. In all the faces are conspicuously banded with black and white, and the tails long, with large dark terminal brushes. The two most desert-loving species, the white and the Beatrix oryx, are paler in general body-colour than the other three, and the latter animal is considerably smaller than any other member of the group, standing not more than 35 inches at the withers. The gemsbuck is the largest and undoubtedly the handsomest of the group, standing 4 feet at the shoulders; the horns of the females are often upwards of 40 inches long, and have been known to attain a length of 48 inches.

In habits all species of oryx seem to be very similar. They are denizens of the arid sun-scorched plains of Africa, which are not necessarily devoid of all kind of vegetation, but are often covered with stunted bush, and carry a plentiful crop of coarse grass after rain. Oryx usually run in herds of from four or five to fifteen or twenty, though the beisa, the most abundant of the group, has been met with in troops numbering 400 or 500 head. All the oryx are shy and wary, and in the open country they usually frequent are difficult to approach on foot. If pursued on horseback, they run at a steady gallop, which they can maintain for long distances, swinging their bushy black tails from side to side, and holding their heads in such a way that their long straight horns are only sloped slightly backwards. Fleet and enduring, however, as oryx undoubtedly are, I am of opinion that in these respects the gemsbuck of South Africa, at any rate, is inferior to all other large antelopes living in the same country, with the single exception of the eland. I have often, when mounted on a fast horse, galloped right up to herds of gemsbuck, and on two occasions have run antelopes of this species to an absolute standstill. Oryx of all species should be approached with caution when badly wounded, as they are liable to make short rushes, and can use their horns with great effect.



GROUP OF BEISA ORYX

This most interesting photograph, taken by Lord Delamere, shows a group of these fine antelopes on the East African plains

Nearly related to the antelopes of the Oryx group in many essential characteristics, yet at once distinguishable by its spiral horns and broad reindeer-like feet, the desert-haunting ADDAX has been placed in a separate genus, of which it is the sole representative.

This remarkable animal stands about 38 inches in height at the withers, and varies in general colour at different seasons of the year, from brownish grey to a reddish hue. The forehead is covered with a thick growth of bushy black hair, beneath which there is a patch of white extending across the nose to under the eyes. The hindquarters, tail, and legs are white The horns are spiral, and are present in both sexes. In the male they attain

Photo by S. G. Payne, Aylesbury, by permission of the Hon. Walter Rothschild

WHITE ORYX

Found in Northern Africa from Dongola to Senegal

a length of about 28 inches in a straight line, and about 36 inches following the spiral. In the female they are thinner and less spirally curved. The addax is confined to the desert regions of Northern Africa from Dongola to Senegal, and the broad, rounded hoofs, so unlike those of any other antelope, would seem to show that it inhabits countries where the soil is deep, soft sand.

Very little is known of the life history or habits of this antelope. It is said to associate in pairs or small herds, and to be entirely independent of water, though it travels great distances over the desert in the track of thunder-storms for the sake of the young herbage which grows so quickly wherever rain falls in those thirsty regions. It is killed in considerable numbers by the Arabs for the sake of its flesh and hide, and is either stalked or hunted on horseback, with the help of greyhounds, by Europeans.

The last of the sub-families into which modern naturalists have divided the antelopes of the world comprises some of the handsomest species of the whole group, and includes the largest of all antelopes, the Eland, as well as such small and beautifully marked creatures as the Harnessed Bushbucks.

With one exception — the Nilgai — all the members of this sub-family are denizens of the great African Continent.

The NILGAI, or BLUE BULL, is an inhabitant of India, and is found throughout the greater portion of the peninsula, from the base of the Himalaya to the south of Mysore. It is an animal of large size, standing about 4 feet 6 inches at the shoulder. In general colour the male is of a dark iron-grey, the female tawny fawn. White spots on the cheeks and just above the hoofs on the fore and hind feet are the outward signs of its affinity to the African harnessed antelopes. The male alone carries horns, which are nearly straight and very small for the size of the animal, rarely exceeding 9 inches in length.

Passing now to the Harnessed Antelopes of Africa, our attention is first claimed by the BUSHBUCKS. Excluding the Inyala and the Broad-

Photo by W. P. Dando] [Regent's Park

BEISA ORYX

The beisa is found in North-east Africa; by some it is believed to have suggested the original idea of the unicorn horned Antelope, we find several forms of the smaller bushbucks recognised by naturalists: *viz.* the HARNESSED ANTELOPE of the forest regions of Western Africa; the CAPE BUSHBUCK of South Africa; CUMMING'S BUSHBUCK of Eastern Africa; and the DECULA BUSHBUCK of Abyssinia. The various forms of bushbuck vary in general colour from very dark brown to various shades of grey-brown, yellow-brown, and rich red. In all species the young are more or less striped and spotted; but whereas in some forms the adult animals lose their stripes and spots almost entirely, in others the adults are more richly marked than immature specimens. For my part, I am inclined to believe that, if large series of bushbuck-skins were collected from every district throughout Africa, it would be found that all the varieties of this animal at present accepted as distinct species would be found to grade into one another in such a way that only one true species could be recognised.

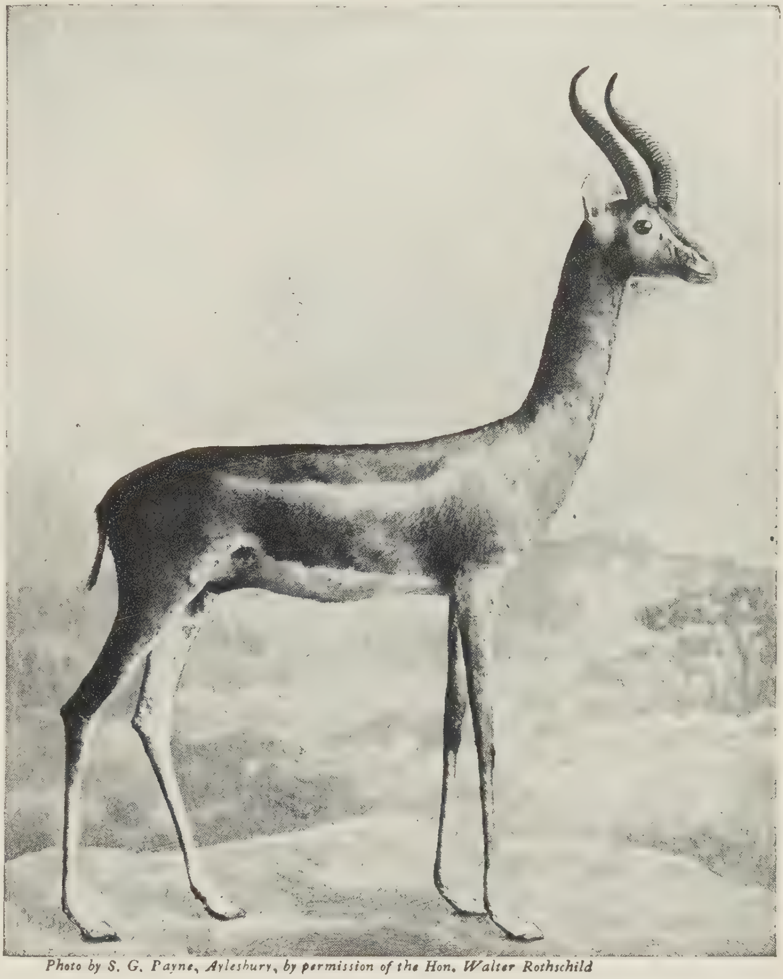


Photo by S. G. Payne, Aylesbury, by permission of the Hon. Walter Rothschild

GERENUK

A gazelle-like antelope with long neck and legs, inhabiting North-east Africa

The bushbucks vary in height at the shoulder from 28 inches to 33 inches, and only the males carry horns, which are nearly straight, with a close spiral twist, and measure in adult animals from 10 inches to 18 inches in length.

Bushbucks are not found in open country, but live in forest or thick bush near the bank of a river, stream, or lake, and are never met with far from water. They are very partial to wooded ravines amongst broken, mountainous country, provided such districts are well watered; and are very solitary in their habits, both males and females being usually found alone, though the latter are often accompanied by a kid or half-grown animal. They are shy and retiring, and should be looked for between daylight and sunrise, or late in the evening, as they are very nocturnal in their habits, and lie concealed in long grass or thick bush during the heat of the day. Their call resembles the bark of a dog, and may often be heard at nights.

The BROAD-HORNED ANTELOPE is only found in the forests of the West African coast range, from Liberia to Gaboon. The male of this species is a very handsome animal, standing about 43 inches at the withers, and is a bright chestnut-red in general colour, with a white spinal stripe extending from the withers to the root of the tail, and fourteen or fifteen white stripes on the shoulders, flanks, and hindquarters. The ears are large and rounded, and the horns very massive, and about 30 inches in length, measured over the single spiral twist. There are two or

Photo by York & Son] [Notting Hill

FEMALE NILGAI

The largest of the antelopes of India, and a distant cousin of the Kudu

horns, which are only present in the male, attain a length of about 2 feet in a straight line, and 30 inches along their spiral curve. The standing height at the shoulder of males of this species is about 42 inches.

This most beautiful antelope has a very restricted range, being only found in a narrow belt of coastland extending from St. Lucia Bay to the Sabi River, in South-east Africa, and in a still smaller area in the neighbourhood of the Upper Shiri River, in British Central Africa.

Before the acquisition of firearms by the natives in South-east Africa, the inyala was very plentiful in Northern Zululand and Amatongaland, and was then to be met with in herds of from ten to twenty individuals; whilst the males, which at certain seasons of the year separated from the females, were in the habit of consorting together in bands of from five to eight. Constant persecution by the natives in Amatongaland and the countries farther north very much reduced the numbers of inyalas in those districts a long time ago; but in Zululand, where this animal has been strictly protected by the British authorities for the last twenty years, it was still plentiful up to 1896, when the rinderpest swept over the country, and committed such sad

three large white spots on the cheeks, and a broad white arrow-shaped mark across the nose below the eyes. The female is similar in colorationto the male, but smaller and hornless.

Little or nothing is known as to the habits of this very beautiful antelope. Du Chaillu, who met with it in the interior of Gaboon between 1856 and 1859, says that it is "very shy, swift of foot, and exceedingly graceful in its motions"; but he does not tell us whether it lives in pairs like the bushbucks, or in small herds like some of its other near allies.

The INYALA is another bush-loving antelope closely allied to the bushbucks. In this species the general colour of the adult male is a deep dark grey, that of the female and young male bright yellow-red, and both sexes are beautifully striped with narrow white bands on the body and haunches. In the male long dark hair hangs from the throat, chest, and each side of the belly, and fringes the front of the thigh almost to the hock, and the back of it up to the root of the tail. The ears are large and rounded; and the

Photo by York & Son] [Notting Hill

ADDAX

Unfortunately, the specimen from which this photograph was tak had lost its splendid spiral horns ravages amongst all the tragelaphine antelopes that it is to be feared the inyala can now no longer be found anywhere in any considerable numbers. Where I met with these antelopes some years ago, in the country to the south of Delagoa Bay, I found them living either alone or in pairs like bushbucks. They frequented dense thickets in the immediate neighbourhood of a river or lagoon, and I never saw one in anything like open country or far away from water. Their tracks showed me that at night they were accustomed to feed in open spaces in the bush, but they always retired to the jungle again at daylight, as they had become very wary and cunning through constant persecution at the hands of the natives.

Closely allied to the bush-antelopes of the present group are the swamp-haunting SITATUNGAS. Three species of these have been described, — one from East Africa, named after Captain Speke; another from tropical West Africa; and a third from Lake Ngami and the Chobi River, named after the present writer.

There is very little difference between the adult males of these three species, except that in the West African form the coat is of a darker colour than in the other two. The main difference consists in the fact that, whereas the female of Selous' sitatunga is light brown in colour like the male, and the newly born young are very dark blackish brown (the colour of a mole), beautifully striped and spotted with pale yellow, the female and young of the other two forms are red in ground-colour, with white spots and stripes. However, personally I am of opinion that there is only one true species of sitatunga in all Africa, and that the differences between the various forms are superficial, and would be found to grade one into the other, if a sufficiently large series of skins of all ages and both sexes could be gathered together from all parts of the continent. In the Barotse Valley, on the Upper Zambesi, my friend Major R. T. Coryndon informs me that both red and brown female sitatungas are met with. On the Lower Chobi and Lake Ngami region the females are never red, but always of the same brown colour as the males, whilst on the Congo all the females are red.

Photo by E. R. Sanborn] [*Courtesy N. Y. Zoological Society*

A PRONGBUCK

From the fact that the horns of the males are annually shed, the prongbuck is assigned to a group apart from the Antelopes

The male sitatunga stands about 3 feet 6 inches at the shoulder, and varies in general colour in different localities from light to dark brown. The adult females are either red with a few faint stripes and spots, or light brown, only retaining very faint traces of any stripes or spots. The young are, both in tropical West and Central East Africa, red, striped, and spotted with white; but in South-west Africa dark blackish brown, with spots and stripes of yellowish white. The hoofs are excessively long, and the skin which covers the back of the pastern is hairless, and of a very thick and horny consistency. The males alone carry horns, which are of the same character as in the inyala, but more spiral and longer, having been known to attain a length of 28 inches in a straight line and 35 inches over the curve.

The sitatunga is an inhabitant of the extensive swamps which exist in many parts of the interior of Africa. It may be said to live in the water, as it passes its life in flooded beds of reeds and papyrus, into the muddy bottoms of which its long hoofs, when splayed out, prevent

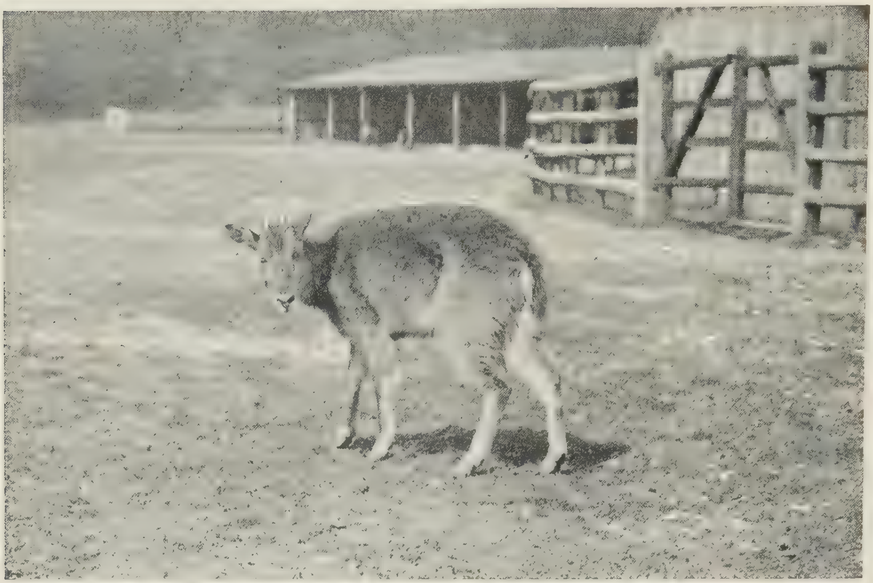


Photo by the Duchess of Bedford]

FEMALE GORAL

The goral is a Himalayan antelope, with somewhat the habits of a chamois

it from sinking. When forced out into dry ground by heavy floods, the formation of its feet so hinders it in running that it can be overtaken and speared by a native on foot. I was informed by the natives on the Chobi River that, when the floods enabled them to paddle their canoes through the reed-beds, they often killed considerable numbers of the sitatungas. These animals, they said, when they saw a canoe approaching, would often not attempt to seek safety by flight, but would sink down in the water, submerging their whole bodies, and leaving only their nostrils above the surface, and in this position were easily speared.

The sitatunga is not gregarious, but is met with singly or in pairs. The hair is long, but soft and silky; and the skins are much sought after by the natives for blankets.

In addition to the bushbucks and sitatungas, two more very notable spiral-horned African antelopes remain to be mentioned — namely, the GREATER KUDU and the LESSER KUDU.

The GREATER KUDU is one of the most magnificent-looking of the whole family of antelopes, and is an animal of large size, an adult male standing 4 feet 9 inches and upwards at the withers. The general colour of this species is light brown to dark grey, the old males looking much darker than females or younger animals, because the scantiness of their coats shows the dark colour of the skin beneath. On each side of the body and hind-quarters there are several white stripes, which vary in number from four to eight or nine. As in all this group of antelopes,

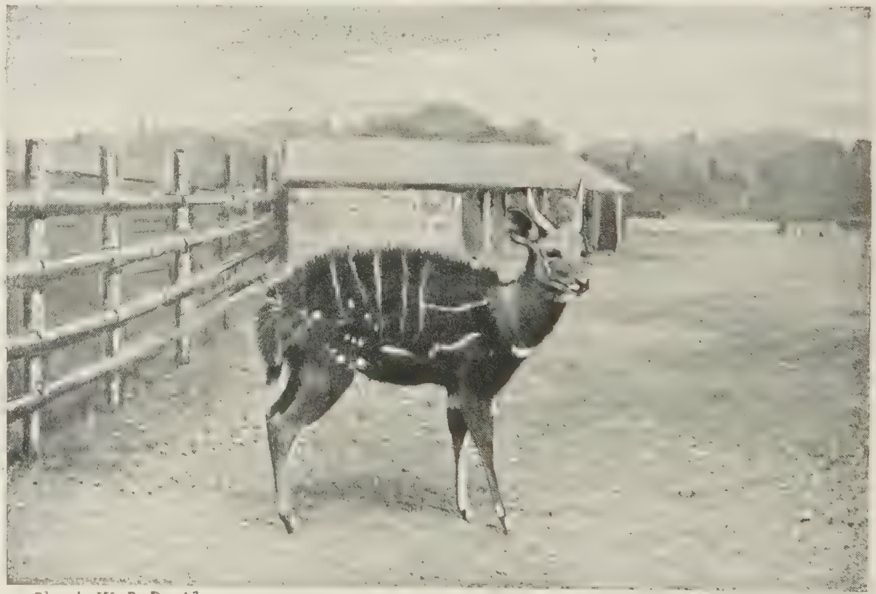


Photo by W. P. Dando] [Regent's Park

HARNESSED ANTELOPE

A very beautiful species, in which the ground-colour of the coat is a rich chestnut, while the spots and stripes are pure white there are two or three cheek-spots, as well as an arrow-shaped white mark across the nose, below the eyes. In the male there is a slight mane on the back of the neck, and a fringe of long white and blackish-brown hair intermixed, extending from the throat to the chest. The ears are very large and rounded, and the male is adorned with magnificent spiral horns, which have been known to attain a length of 48 inches in a straight line from base to tip, and 64 inches over the curve.

The greater kudu once had a very wide range, which extended from the central portions of the Cape Colony to Angola on the west, and on the east throughout East Africa up to Abyssinia; but, with the single exception of the buffalo, no species of wild animal suffered more from the terrible scourge of rinderpest which recently swept over the continent than this lordly antelope, and it has almost ceased to exist in many districts of South and South Central Africa, where up to 1896 it was still very numerous.

The greater kudu is a bush-loving antelope, and very partial to wooded hills, though it is also plentiful in the neighbourhood of rivers which flow through level tracts of country covered with forest and bush. In my own experience it is never found at any great distance from water. It eats leaves and wild fruits as well as grass, and lives in small herds or families, never, I believe, congregating in large numbers. In Southern Africa, at any rate, it was always exceptional to see more than twenty greater kudus together, and I have never seen more than thirty. At certain seasons of the year the males leave the females, and live alone or several together. I once saw nine magnificently horned kudus standing on the bank of the Chobi, and I have often seen four or five males of this species consorting together. As a rule the greater kudu is met with in hilly country or in bush so dense that a horse cannot gallop through it at full speed; but if met with in open ground, a good horse can overtake an old male without much difficulty. The females are much lighter and faster and cannot be overtaken in any kind of ground.

The greater kudu is one of the most timid and inoffensive of animals, and when attacked by dogs will not make the slightest attempt to defend itself either with its horns or by kicking.

The LESSER KUDU in general colour nearly resembles its larger relative, but is much smaller, the males only standing about 40 inches at the withers, and it lacks the long fringe of hair under the throat. The white stripes on the body and hindquarters are, however, more numerous — from eleven to fourteen; and the horns, which are only present in the males, are less divergent, and with the spiral curvature much closer than in the greater kudu.

The lesser kudu is an inhabitant of Somaliland and the maritime

Photo by Percy Ashenden] [*Cape Town*

MALE KUDU

A kudu bull stands about 5 feet or a little more at the withers, being in size only inferior to the eland. The horns form a corkscrew-like spiral districts of British East Africa. It frequents thick scrubby jungle, and is said to be exceedingly watchful and wary. It lives either in pairs or in small families, but never congregates in large herds. Like all the tragelaphine antelopes, this species is a leaf-eater, and feeds principally during the night, lying up in thick bush during the heat of the day.

There remains to be mentioned but one other group of antelopes, the ELANDS, large, heavily built animals, which belong to the present group, but differ from all species of kudu, sitatunga, and bushbuck, inasmuch as both sexes are horned. There are two forms of the COMMON ELAND—namely, the grey variety of South-western Africa, and the striped animal, which is found in the countries farther north and east. The two forms grade one into the other, and are absolutely identical in their habits and mode of life, the differences between them being merely superficial. To the south of the twenty-third parallel of south latitude all elands are of a uniform fawn colour, except the old animals, which look dark grey, from the fact that the scantiness of their coats allows the dark colour of the skin to show through the hair. Old males, when standing in the shade of a tree, appear to be of a deep blue-grey in colour, and are known to the colonists of South Africa as "blue bulls." In Rhodesia, South-east Africa, and the countries to the north of the Zambesi, all the elands are bright chestnut-red when young, with a black line down the centre of the back from the withers to the tail, broad black patches on the backs of the fore legs above the knees, and eight or nine white stripes on each side. When they grow old, the ruddiness of the ground-colour gradually fades, the black markings on the fore legs die out, and the white stripes become indistinguishable at a short distance, the old bulls looking deep blue-grey in general colour. Every intermediate stage of colouring between the unstriped and the highly coloured forms of eland is to be found in the district lying between the central portions of the Kalahari Desert and the Zambesi River. Old male elands south of the Zambesi develop a growth of long, bristly black hair on the forehead, which often hangs over their eyes and extends half-way down their noses. North of the Zambesi this growth of hair is not nearly so luxuriant.

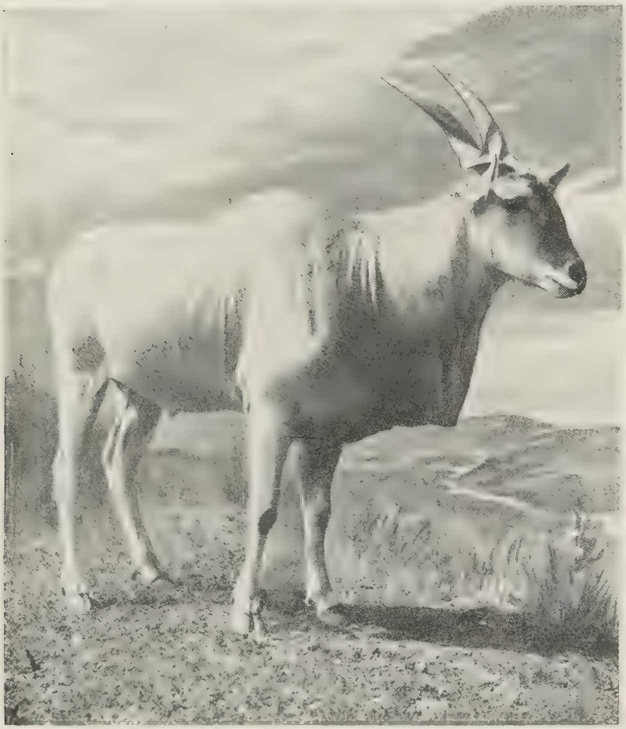


Photo by J. W. McLellan] *[Highburg*

ELAND

A feature of the eland is the large "dewlap." Unlike the kudu, both sexes are horned

I have carefully measured the standing height at the withers of many old male elands in the interior of South Africa, and found that it varied from 5 feet 8 inches to 5 feet 10 inches. The horns of bulls in their prime measure from 26 inches to 33 inches in length, but old bulls wear their horns down very much. The cows carry longer, though thinner horns than the bulls.

The range of the eland once extended from Cape Agulhas to the White Nile, but it has become extinct in many districts of Southern Africa, and in almost every other portion of its range has, like all other tragelaphine antelopes, suffered so cruelly from the recent visitation of rinderpest that it has now become a scarce animal all over Africa.

During the rainy season elands are usually met with in small herds of from four or five

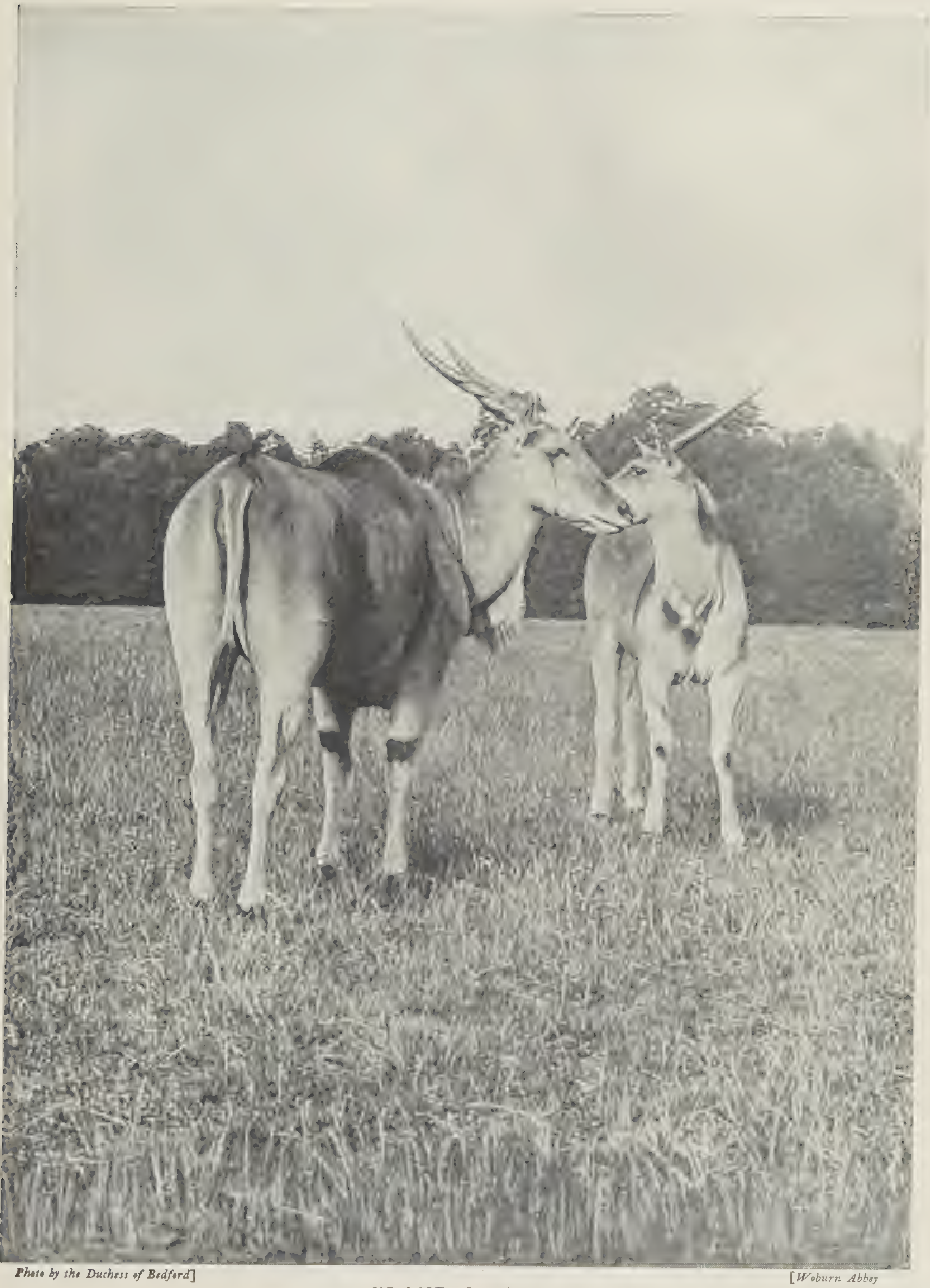


Photo by the Duchess of Bedford] [*Woburn Abbey*

ELAND COWS

Female elands carry longer, although more slender horns than the bulls to ten individuals; but towards the end of the dry season they collect into large herds, and at such times I have often seen from fifty to over two hundred of these animals in one troop.

In my experience elands live for two-thirds of the year in forest or bush-covered country, or amongst rugged hills; and in such localities they are difficult to overtake on horseback; but in the middle of the dry season, as soon as they smell the smoke of the grass fires lighted by the natives on the open plateaux, they leave their retreats, and, collecting in herds, wander out on to the treeless plains in search of young grass. They then fall an easy prey to a mounted hunter, especially the heavy old bulls, which can be run to a standstill with ease by a very moderate horse.

The flesh of the eland is excellent when the animal is in good condition, as at such a time these animals become very fat, especially the old bulls, whose hearts become encased in a mass of fat which will often weigh 20 lbs. It is a mistake, however, to think that eland-meat is always good; for towards the end of the dry season, when there is little grass to be got, they feed extensively on the leaves of certain bushes, and their meat at such times becomes very poor and tasteless.

Besides the common eland of Southern, Central, and Eastern Africa, another distinct species is met with in Senegal and the Gambia Colony. This is the DERBIAN ELAND, about which animal our knowledge is still very slight, as I believe that it has never yet been shot nor its habits studied by a European traveler. A good many skulls and horns and a few skins have been obtained from natives, from which it appears that in general colour this species is of a rich reddish-fawn colour, becoming nearly white below, the middle of the belly being black. The neck is covered with long hair of a dark brown or black colour, blacker towards the shoulder than in front. A broad black stripe extends all down the centre of the back from the neck to the root of the tail, and there are large black patches on the backs and inner sides of the fore legs above the knees. On each side of the body and haunches there are thirteen or fourteen narrow white stripes. The horns are larger and more massive and divergent than in the common eland.

The Derbian eland is said to be a forest-loving animal, never of its own accord coming out into the plains. It lives in small herds, is very shy and not at all abundant, and browses on the leaves and young shoots of various trees and bushes.

Photo by W. P. Dando]

BULL ELAND

The flesh of the eland is of better flavour than that of most other large game. If sheltered in winter, the species will thrive in English parks

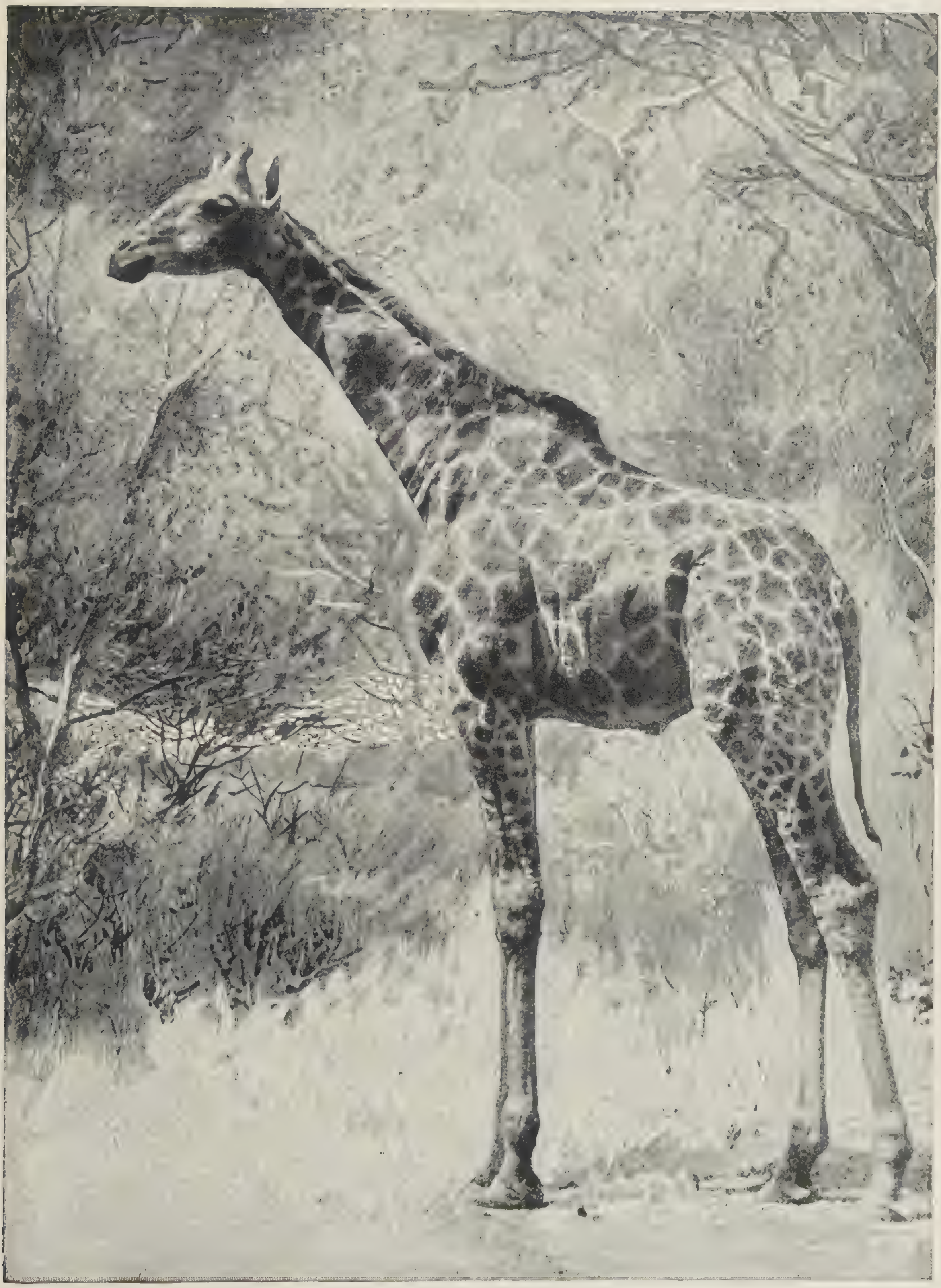


Photo by W. P. Dando]

THE SOUTHERN GIRAFFE

The tallest mammal ever known to walk the earth

CHAPTER XVI

THE GIRAFFE AND OKAPI

THE GIRAFFE

BY H. A. BRYDEN

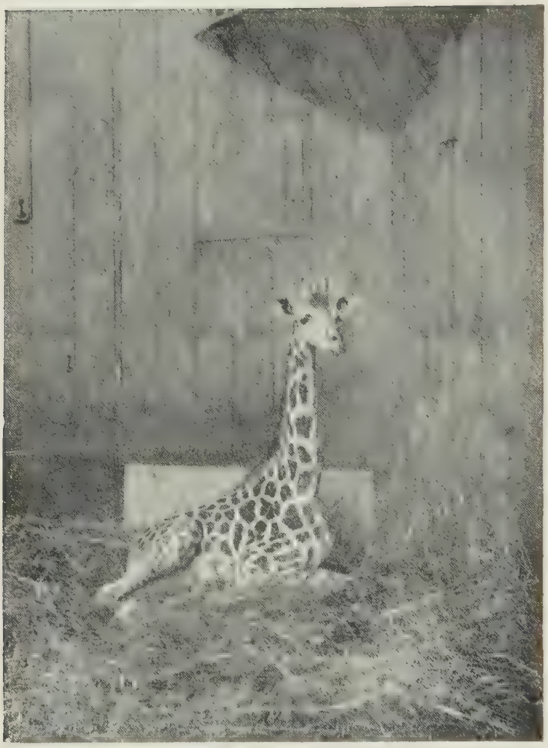


Photo by Miss E. J. Beck

SOUTHERN GIRAFFE LYING DOWN

This giraffe was a present to Queen Victoria; it only lived fourteen days after its arrival

GIRAFFES, which are found only in the continent of Africa, are the tallest of all living creatures. They belong to the Ruminants, or Cud-chewers, and naturalists are inclined to place them somewhere between the Deer Family and the Hollow-horned Ruminants, in which latter are to be found oxen, buffaloes, and antelopes. Rütimeyer, the Swiss naturalist, once defined them as "a most fantastic form of deer," which is, perhaps, as good a definition of them as one is likely to hit upon. Fossil discoveries show that, in ages long remote, great giraffe-like creatures, some of them bearing horns or antlers, roamed widely in the south of Europe, Persia, India and even China.

Of living giraffes, two species have thus far been identified, — the SOUTHERN or CAPE GIRAFFE, with a range extending from Bechuanaland and the Transvaal to British East Africa and the Soudan; and the NUBIAN or NORTHERN GIRAFFE, found chiefly in East Africa, Somaliland, and the country between Abyssinia and the Nile. The southern giraffe, which, from its recent appearance in the Gardens of the Zoological Society, is now the more familiar of the two animals, has a creamy or yellowish-white ground-colour, marked by irregular blotches, which vary in colour, in animals of different ages, from lemon-fawn to orange-tawny, and in older specimens to a very dark chestnut. Old bulls and occasionally old cows grow extremely dark with age, and at a distance appear almost black upon the back and shoulders. The northern giraffe is widely different, the coloration being usually a rich red-chestnut, darker with age, separated by a fine network of white lines, symmetrically arranged in polygonal patterns. At no great distance this giraffe, instead of having the blotchy or dappled appearance of the southern giraffe, looks almost entirely chestnut in colour. Again, the southern giraffe has only two horns, while the northern species usually develops a third, growing from the centre of the forehead. These horns, which are covered with hair in both species, and tufted black at the tips, are, in the youthful days of the animal, actually separable from the bones of the head. As the animal arrives at maturity, they become firmly united to the skull. A third race or sub-species of giraffe has been identified in Western Africa mainly from the skull and cannon-bones of a specimen shot in 1897 at the junction of the Binue and Niger Rivers; but very little is known abont this form. Other varieties or sub-species may yet be discovered in other parts of the Dark Continent. It is lacking in the giraffe's long neck.

The towering height of the giraffe is entirely attributable to the great length of the neck and limbs. A full-grown bull giraffe will certainly measure occasionally as much as 19 feet in height. I measured very carefully a specimen shot by my hunting friend, Mr. W. Dove, in the forests of the North Kalahari, South Africa, which taped 18 feet 11½ inches. A fine cow, shot by myself in the same country, measured 16 feet 10 inches, and there is no reason to suppose that cow giraffes do not easily reach fully 17 feet in height. These animals feed almost entirely upon the leaves of acacia-trees, the foliage of the *kameel-doorn*, or giraffe-acacia, affording their most favourite food-supply. It is a most beautiful spectacle to see, as I have seen, a large troop of these dappled giants — creatures which, somehow, viewed in the wild state, always seem to me to belong to another epoch — quietly browsing, with upstretched necks and delicate heads, among the branches of the spreading *mokala*, as the Bechuanas call this tree.

The giraffe's upper lip is long and prehensile, and covered, no doubt as a protection against thorns, with a thick velvety coating of short hair. The tongue is long — some 18 inches in length — and is employed for plucking down the tender leafage on which the giraffe feeds. The eyes of the giraffe are most beautiful — dark brown, shaded by long lashes, and peculiarly tender and melting in expression. Singularly enough, the animal is absolutely mute, and never, even in its death-agonies, utters a sound. The hoofs are large, elongate, nearly 12 inches in length in the case of old bulls, and look like those of gigantic cattle. There are no false hoofs, and the fetlock is round and smooth. The skin of a full-grown giraffe is extraordinarily tough and solid, attaining in the case of old males as much as an inch in thickness. From these animals most of the *sjamboks*, or colonial whips, in use all over South Africa, are now made; and it is a miserable fact to record that giraffes are now slaughtered by native and Boer hunters almost solely for the value of the hide, which is worth from £3 to £5 in the case of full-grown beasts. So perishes the giraffe from South Africa.

Giraffes live mainly in forest country, or country partially open and partially clothed with thin, park-like stretches of low acacia-trees. When pursued, they betake themselves to the densest part of the bush and timber, and, their thick hides being absolutely impervious to the frightful thorns with which all African jungle and forest seem to be provided, burst through every bushy obstacle with the greatest ease. They steer also in the most wonderful manner through the timber, ducking branches and evading tree-boles with marvellous facility. I shall never forget seeing my hunting comrade after his first chase in thick bush. We had ridden, as we always rode hunting, in our flannel shirts, coatless Attracted by his firing, I came up with my friend, who was sitting on the body of a huge old bull giraffe, which had fallen dead in a grassy clearing. He was looking ruefully at the remains of his shirt, which hung about him, literally in rags and ribbons. Blood was streaming from innumerable wounds upon

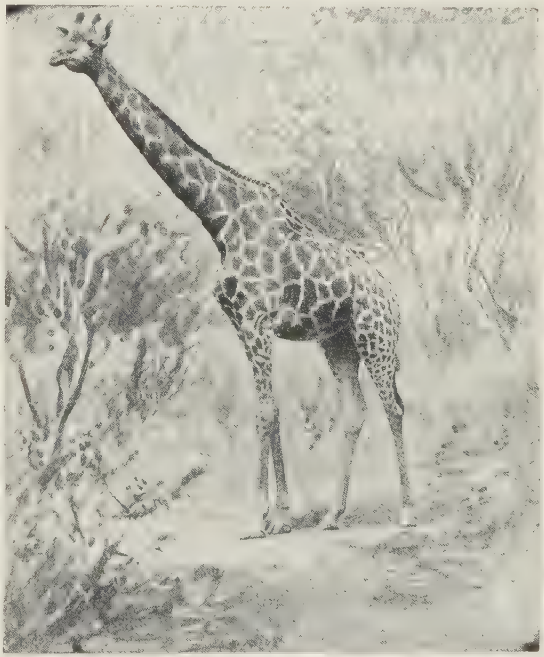


Photo by W. P. Dando] [*Regent's Park*

MALE SOUTHERN GIRAFFE

The coloration of these animals harmonises exactly with the dark and light splashes of their surroundings his chest, neck, and arms. Always after that we donned cord coats, when running giraffes in bush and forest country.

Photo by A. S. Rudland & Sons

A GIRAFFE GRAZING

Grazing is evidently not the natural mode of feeding of these animals, which are essentially browsers

In regions where they have been little disturbed, giraffes no doubt wander across open plains, and are to be seen well away from the denser forests, feeding among scattered islets of acacias, easily exposed to the human eye. But in South Africa they are now seldom to be met with out of the forest region. Once, and once only, have I seen giraffes in the open. This was on the outskirts of the forest, and the great creatures had been tempted to a little knoll of *mokala* trees, rising like an islet from the sea of grass.

One's first impression of these creatures in the wild state is very deceptive. I well remember first setting eyes upon a troop of five or six. As they swung away from the leafage on which they were feeding, my friend and I cantered easily, thinking that we should soon come up with them. We were completely deceived. With those immense legs of theirs, the great creatures, going with their easy, shuffling, but marvellously swift walk, were simply striding away from us. Discovering our mistake, we rode hard, and the giraffes then broke into their strange, rocking gallop, and a headlong, desperate chase began, to be terminated by the death of a fine cow. Like the camel, the giraffe progresses by moving the two legs upon either side of the body simultaneously. At this strange, rocking gallop these animals move at a great pace, and a good Cape horse is needed to run into them. By far the best plan, if you are bent on shooting these animals, is to press your pony, so soon as you sight giraffes, to the top of its speed, and force the game beyond its natural paces in one desperate gallop of a couple of miles or so. If well mounted, your nag will take you right up to the heels of the tall beasts, and, firing from the saddle, you can, without great difficulty, bring down the game. The giraffe, unlike the antelopes of Africa, is not very tenacious of life, and a bullet planted near the root of the tail will, penetrating the short body, pierce a vital spot, and bring down the tall beast crashing to earth. Having tasted the delights of fox-hunting and many other forms of sport, I can testify that the run up to a good troop of giraffes is one of the most thrilling and exciting of all human experiences. There is nothing else quite like it in the wide range of sporting emotions. Having enjoyed this thrilling pleasure a few times, however, the humane hunter will stay his hand, and shoot only when meat, or perhaps an exceptionally fine specimen, is absolutely needed. Giraffes are, of course, utterly defenceless, and, save for their shy, wary habits and remote, waterless habitat, have nothing to shield them from the mounted hunter.

Giraffe-hunting on foot is a very different matter. In that case the giraffe has the better of it, and the stalker is placed at great disadvantage. These animals are in many places found in extremely waterless country, where even the mounted hunter has much trouble to reach them. Like elands and gemsbok and other desert-loving antelopes, they can exist for long periods — months together — without drinking. In the northern portions of the Kalahari Desert, where I have carefully observed their habits, as well as hunted them, it is an undoubted fact that giraffes never touch water during the whole of the dry winter season — for several months on end. Gemsbok and elands in the same waterless tract of country are complete abstainers for the same period. The flesh of a giraffe cow, if fairly young, is excellent, tender and well tasted, with a flavour of game-like veal. The marrow-bones also, roasted over a gentle wood fire, and sawn in half, afford delicious eating, quite one of the supreme delicacies of the African wilderness.

THE OKAPI

BY SIR HARRY JOHNSTON, K.C.B., F.Z.S.

READERS of "The Living Animals of the World" are in all probability readers of newspapers, and it would therefore be affectation on the part of the writer of these lines to assume that they have not heard more or less of the discovery which he was privileged to make of an entirely new ruminant of large size, dwelling in the forests bordering the Semliki River, in Central Africa, on the borderland between the Uganda Protectorate and the Congo Free State. The history of this discovery, stated briefly, is as follows: — In 1882–83 I was the guest of Mr. (now Sir Henry) Stanley on the River Congo at Stanley Pool. I was visiting the Congo at that time as an explorer in a very small way and a naturalist. Mr. Stanley, conversing with me on the possibility of African discoveries, told me then that he believed that all that was most wonderful in tropical Africa would be found to be concentrated in the region of the Blue Mountains, south of the Albert Nyanza. This feeling on Stanley's part doubtless was one of the reasons which urged him to go to the relief of Emin Pasha. His journey through the great Congo Forest towards the Blue Mountains of the Albert Nyanza resulted in his discovery of the greatest snow mountain-range of Africa, Ruwenzori, and the river Semliki, which is the Upper Albertine Nile; of Lake Albert Edward, from which it flows round the flanks of Ruwenzori; and, amongst other things, in more detailed information regarding the dwarf races of the Northern Congo forests than we had yet received. Stanley also was the first to draw the attention of the world to the dense and awful character of these mighty woods, and to hint at the mysteries and wonders in natural history which they possibly contained. The stress and trouble of his expedition prevented him and his companions from bestowing much attention on natural history; moreover, in these forests it is extremely difficult for persons who are passing hurriedly through the tangle to come into actual contact with the beasts that inhabit them. Sir Henry Stanley, discussing this subject with me since my return from Uganda, tells me that he believes that the okapi is only one amongst several strange new beasts which will be eventually discovered in these remarkable forests. He describes having seen a creature like a gigantic pig 6 feet in length, and certain antelopes unlike any known type In regard to the okapi, the only hint of its existence which he obtained was the announcement that the dwarfs knew of the existence of a creature in their forests which greatly resembled an ass in appearance, and which they caught in pits. This tiny sentence in an appendix to his book "In Darkest Africa" attracted my attention some time before I went to Uganda. It seemed to me so extraordinary that any creature like a horse should inhabit a dense

Photo by Charles Knight]

A GIRAFFE BROWSING

Here the posture is seen to be thoroughly natural forest, that I determined, if ever fate should lead me in that direction, I would make enquiries.

Soon after reaching the Uganda Protectorate at the end of 1899, I came in contact with a large party of dwarfs who had been kidnapped by a too enterprising German impresario, who had decided to show them at the Paris Exhibition. As the Belgians objected to this procedure, I released the dwarfs from their kidnapper, and retained them with me for some months in Uganda, until I was able personally to escort them back to their homes in the Congo Forest. I had other reasons connected with my Government business for visiting the north-western part of the Congo Free State. As soon as I could make the dwarfs understand me by means of an interpreter, I questioned them regarding the existence of this horse-like creature in their forests. They at once understood what I meant; and pointing to a zebra-skin and a live mule, they informed me that the creature in question, which was called OKAPI, was like a mule with zebra stripes on it. When I reached Fort Mbeni, in the Congo Free State, on the west bank of the river Semliki, I put questions to the Belgian officers stationed there. They all knew the okapi, at any rate, when dead. As a living animal they had none of them seen it, but their native soldiers were in the habit of hunting the animal in the forest and killing it with spears, and then bringing in the skin and the flesh for use in the fort. One of the officers declared there was even then a freshly obtained skin lying about in the precincts of the fort. On searching for this, however, it was discovered that the greater part of it had been thrown away, only the gaudier portions having been cut into strips by the soldiers to be made into bandoliers. These strips, together with similar ones obtained from natives in the forest, I sent to England, to Dr. P. L. Sclater, for his consideration. Furnished by the Belgian officers with guides, and taking with me all the dwarfs whom I had brought from Uganda, I entered the forest, and remained there for some days searching for the okapi. All this time I was convinced that I was on the track of a species of horse; and therefore when the natives showed the tracks of a cloven-footed animal like the eland, and told us these were the foot-prints of the okapi, I disbelieved them, and imagined that we were merely following a forest eland. We never saw the okapi; and as the life in the forest made the whole expedition extremely ill, and my time was required for official work elsewhere, I was obliged to give up this search. Meantime, I had elicited from the natives, whom I questioned closely, that the okapi was a creature without horns or any means of offence, the size of a large antelope or mule, which inhabited only the densest parts of the forest, and generally went about in pairs, male and female. It lived chiefly on leaves. The Belgian officers, seeing that I was disappointed at not obtaining a complete skin, offered to use their best efforts to obtain one for me, and send it on to Uganda after my departure.

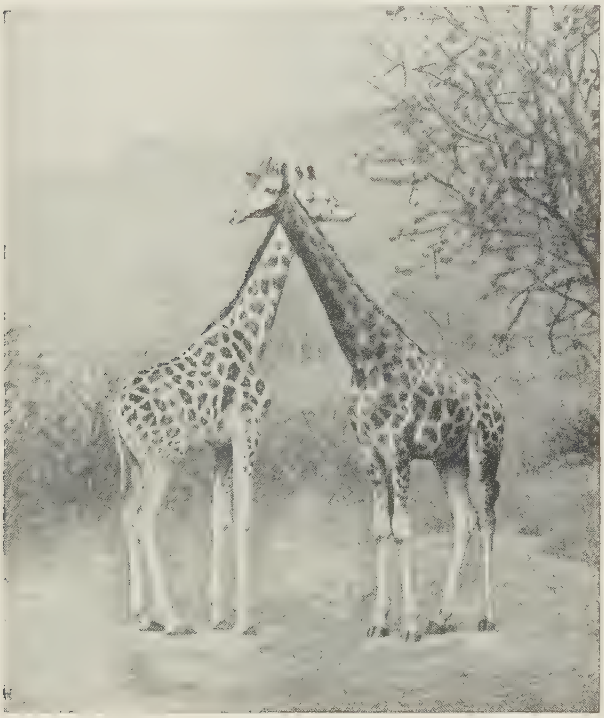
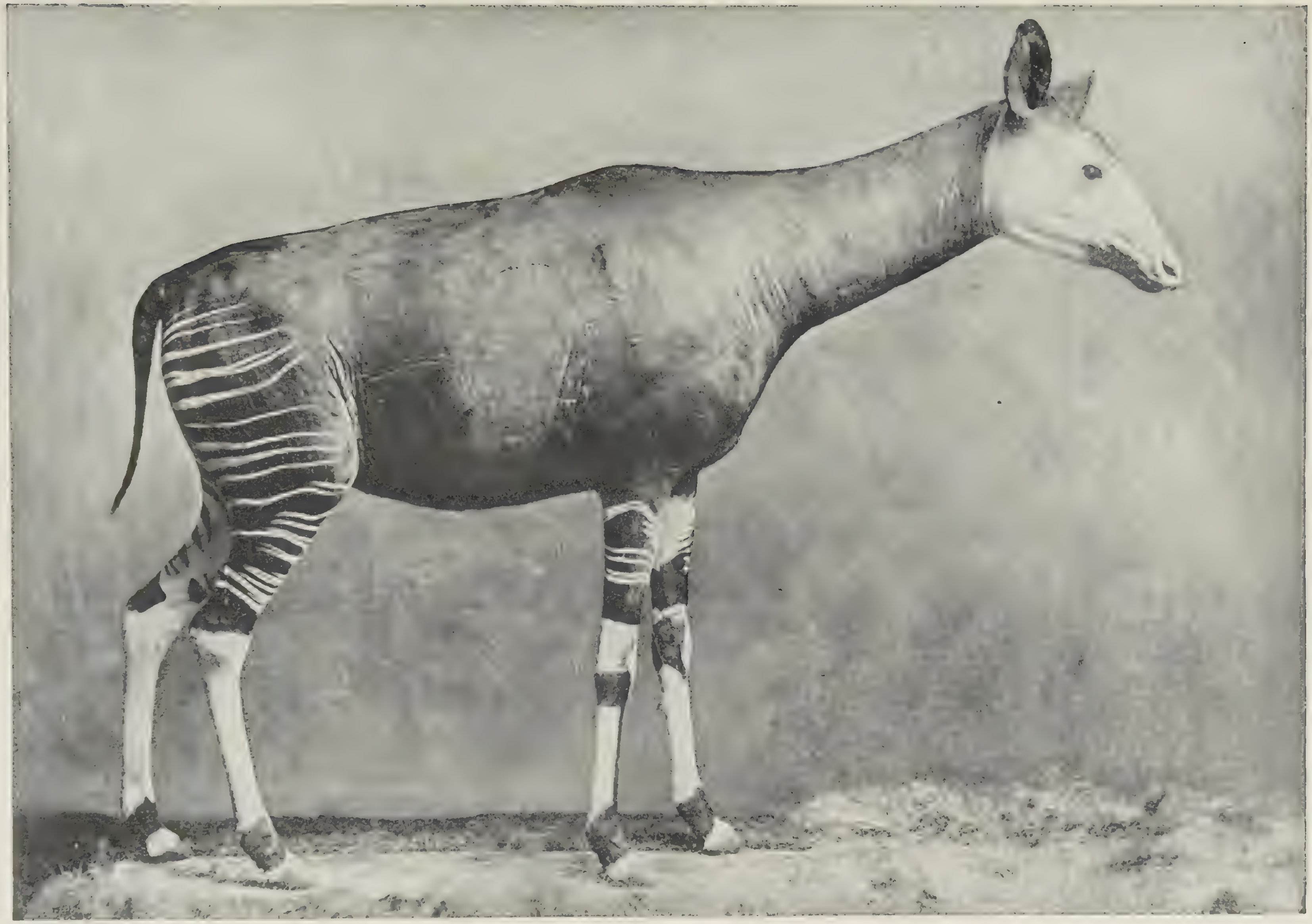


Photo by York & Son] [*Notting Hill*

MALE AND FEMALE GIRAFFES

Giraffes are said to be very affectionate animals

This promise was eventually redeemed by Mr. Karl Eriksson, a Swedish officer in the Belgian service. Mr. Eriksson sent me a complete skin and two skulls. The skin and the



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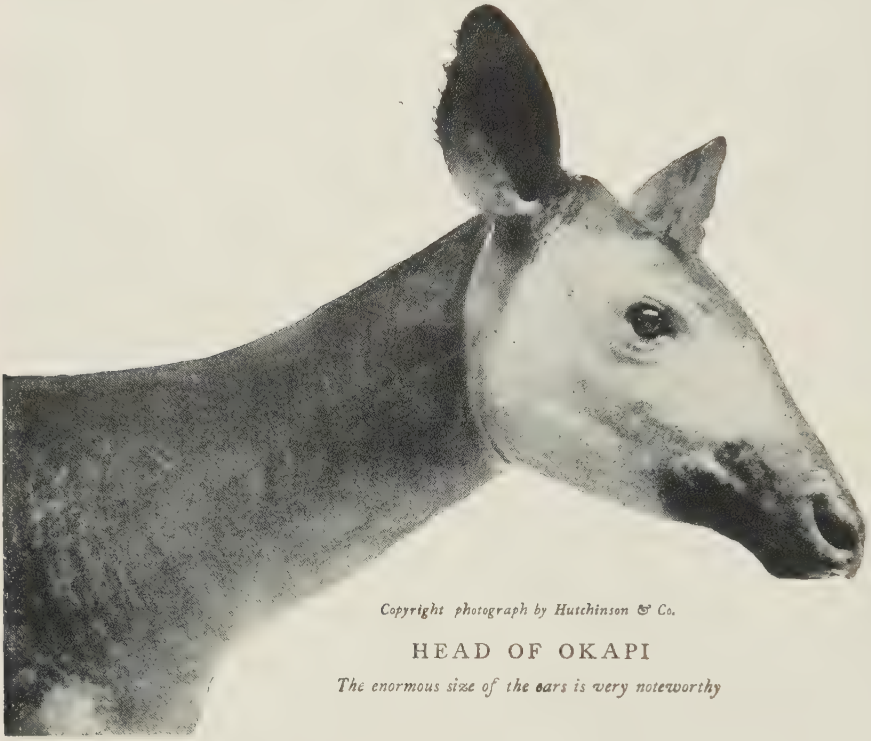
THE OKAPI OF THE CONGO FOREST

Previous to the discovery of this ruminant the giraffe stood alone among the mammals of the world. It has now at least one living relative bigger of the two skulls belonged to a young male. This is the skin which is now set up in the Natural History Museum at South Kensington, and of which a photographic illustration accompanies this notice. Upon receiving this skin, I saw at once what the okapi was — namely, a close relation of the giraffe. From the very small development of the horn-bosses, I believed that it was nearer allied to the helladotherium than to the living giraffe. In forwarding the specimens to Professor Ray Lankester, I therefore proposed that it should be called *Helladotherium tigrinum*. Professor Ray Lankester, having examined the specimens with a greater knowledge than I possessed, decided that the animal was rather more closely allied to the giraffe than to the helladotherium, but that it possessed sufficient peculiarities of its own to oblige him to create for its reception a new genus, which he proposed to call *Ocapia*.

Meantime, the original strips of the skin (which apparently belonged to an older and larger animal than the specimen mounted at South Kensington) had been pronounced by experts to whom they were submitted to be the skin of an undiscovered species of horse, and this supposed new horse had been tentatively named by Dr. P. L. Sclater *Equus johnstoni*. The full discovery obliged Professor Ray Lankester to set aside any idea of the okapi being allied to the horse, but he was good enough to attach Mr. Sclater's specific name of *johnstoni* to his newly founded genus of *Ocapia*.



Copyright photograph by Hutchinson & Co.

HEAD OF OKAPI

The enormous size of the ears is very noteworthy

Up to the time of writing this is all that is known of this extraordinary survival in the Congo Forest of the only living relation of the giraffe. We know by palæontological discoveries in Europe and in Asia that there existed a large family of ruminants which in their development and features were neither of the Ox group nor of the Deer, but in some respects occupied a position midway between these two branches of cloven-hoofed, horned, ruminating Ungulates. To this family the Giraffe, the Okapi, the Helladotherium, the Samotherium, the Sivatherium, and the Bramatherium belong. In all probability bony projections arose from the skulls of these creatures similar in some measure to the prominent bony cores of the horns of oxen. From the top, however, of these bony cores there would seem to have arisen anciently antlers, possibly deciduous like those of the prongbuck. In time creatures like the giraffe lost any need for such weapons of offence, and ceased to grow antlers; but the bony cores from which these antlers once proceeded still remained, and in the case of the giraffe remain to the present day. In the helladotherium and in the okapi these bony cores have dwindled to mere bumps.

CHAPTER XVII

THE DEER TRIBE

BY H. A. BRYDEN

DEER represent as a family the non-domesticated class of ruminants. Generally speaking the males are distinguished by antlers, which are shed periodically, usually once a year, and again renewed. Comprising as it does some of the noblest mammals to be found on the face of the earth, this large and important tribe is to be found distributed over a large portion of the world's surface, from the Arctic North, the home of the wild reindeer, to Patagonia, in Southern South America. Deer are, however, not found in the continent of Africa south of the Sahara, nor in Madagascar or Australia. They are not indigenous to New Zealand; but the red deer, introduced there some years ago for purposes of sport, have thriven wonderfully well, and are now completely acclimatised.

From the earliest times deer, especially those species known as the true or typical deer, of which red deer may be said to be a type, have been animals of considerable importance to mankind. Their flesh has been always eagerly sought after; deer-skin is still, even in these days of high civilisation, useful for many purposes; and the antlers are almost equally in request.

It is more than probable that, in the vast and still little-explored regions of Central, East, and Northern Asia, new species of deer remain to be discovered. At the present time there are known to exist, in various parts of the world, close on a hundred species and varieties. Within the space allotted to these animals it is, of course, manifestly impossible to notice all these in anything like detail. Many of the varieties or sub-species closely resemble one another, so much so that the differences between them are only apparent to the eyes of naturalists or acute observers.

THE REINDEER

REINDEER are distinguished from all other kinds of deer by the fact that antlers are borne by both males and females. The

Photo by Valentine & Sons, Ltd.] [*Dundee*

SCANDINAVIAN REINDEER

The spreading hoofs enable the reindeer to traverse snow and swamps without sinking antlers, as may be seen by the illustration, differ materially from those of the red deer, elk, and other species; the brow-tines, especially, are often much palmated. These animals are heavily built, short-legged, and, as beseems dwellers in a snowy habitat, provided with round, short, and spreading hoofs. For ages reindeer have been domesticated by the Lapps of Scandinavia, the Samoyeds, and other primitive races of Northern Europe and Asia. Trained to harness, and drawing a sledge, they traverse long distances, while their milk, flesh, and hides are of great importance to the people who keep them. The COMMON or SCANDINAVIAN REINDEER ranges from Norway through Northern Europe into Asia, though how far eastward is not yet accurately determined. It is interesting to note that these animals were once denizens of Britain, and so lately as the twelfth century the Jarls of Orkney are believed to have been in the habit of crossing to the mainland for the purpose of hunting them in the wilds of Caithness. Wild reindeer are still to be found in the remoter parts of Norway, though, from much persecution, they are becoming comparatively scarce in most parts of the country.

Photo by C. Reid] [*Wishaw, N.B*

PARK RED DEER

The typical representative of the entire Deer Tribe

Mr. Abel Chapman, in his "Wild Norway," gives some excellent accounts of sport with these fine deer. Speaking of a good herd of twenty-one, discovered in Ryfylke, he says: "Most of the deer were lying down, but both the big stags stood upright in dreamy, inert postures. . . . I now fully realised what a truly magnificent animal I had before me. Both in body and horn he was a giant, and his coat was no less remarkable; the neck was pure white, and beneath it a shaggy mane hung down a foot in length. This white neck was set off by the dark head in front and the rich glossy brown of his robe behind. Besides this the contrasting black and white bars on flanks and stern were conspicuously clean-cut and defined, and the long and massive antlers showed a splendid recurved sweep, surmounted by branch-like tines, all clean." For three long, agonising hours the stalker watched this noble prize, and then one of those lucky chances which occasionally gladden the hunter's heart occurred, and the reindeer approached within a hundred yards. "Half-a-dozen forward steps, and his white neck and dark shoulder were beautifully exposed. Already, ere his head had appeared, the rifle had been shifted over, and now the foresight dwelt lovingly on a thrice-refined aim. The 450 bullet struck to an inch, just where the shaggy mane joined the brown shoulder.

The Red Deer.

Mr. J. G. Millais, author of "British Deer and their Horns" and other works, himself a first-rate sportsman in many parts of the world, compares the style of shooting red deer in vogue forty or fifty years ago with that obtaining in the Highlands at the present day. "A stalker in Black Mount, Argyllshire," he says, "told me of a typical day's sport in which he took part some forty years ago. Fox Maule and Sir Edwin Landseer were the two rifles (they frequently stalked in pairs at that time), and, on the side of Clashven, Peter Robertson, the head forester, brought them within eighty yards of two exceptionally fine stags Maule fired and missed, as did also Sir Edwin as the stags moved away; then, on a signal from Robertson, Peter McColl, the gillie, slipped the hounds — the two best ever owned by the late Marquis of Breadalbane, and whose portraits are still preserved in the famous picture of 'The Deer Drive' — and away they went in hot pursuit of the deer. An end-on chase now ensued, the line taken being due east down the great glen towards Loch Dochart, and at last the stalkers were brought to a standstill, being fairly exhausted both in wind and limb. At this moment, however, four dark spots, like small rocks, standing out at the point of a little promontory in the lake, attracted their attention, and, on drawing nearer, they saw, to their surprise, each of the big stags being held at bay by a gallant hound. A couple of shots then settled the business, and so ended what was then considered a grand day's sport. No doubt it was most exciting to see the struggle of bone and sinew between two such noble quadrupeds, but it was not rifle-shooting. To-day the gallant but disturbing deer-hound has given place to the cunning and obedient collie, and the success of the stalker depends, for the most part, on the accuracy of his rifle and his skill in using it."

Photo by W. P. Dando

AN ASIATIC WAPITI

All the races of the wapiti are easily recognisable by the large fourth tine of the antlers and the short tail

Here are a couple of sketches of modern stalking taken from Mr. Millais' own diary: —

"*Wednesday, October 4th.* — Started for the big corrie with McColl, and saw nothing till we got to the Eagle Hill. On this were three stags and about twenty hinds, the property of a magnificent fellow carrying one of the best heads I have ever seen on Black Mount. For some time McColl thought he was just a bit too good to shoot, for the very best in this forest are generally left for stock purposes. Finding, however, that he was not Royal [a twelve-pointer], my companion agreed to a shot — that is, if he got within shooting distance, which was not too likely, the Eagle Hill being one of those queer places where back eddies are carried down from almost every 'airt' from which the wind is blowing. Luck is apparently entirely my way this week, so far at any rate. The big stag was very 'kittle,' frequently roaring and keeping his hinds moving before him along the hillside, in the direction of another corrie running at right angles, the entrance to which, if reached, would checkmate us. A quick, stiff climb, and a dashing piece of stalking on the part of McColl, brought us in front of the herd only just in time, for I had hardly got into position when the first few hinds moved past a hundred yards below us. They were very uneasy and highly suspicious, but fortunately did not stop; and in another moment, to my joy, the big stag came slowly behind them, and offered a fair broadside in the very spot where I should have wished him to stand. The bullet took him through the ribs, certainly a trifle too far back, but he gave in at once, and rolled 150 yards down the hill, fortunately without hurting his horns. A really fine Highland stag in his prime; weight, 16 stone 2 lbs., with a good wild head of ten points, and good cups on the top."

"*Thursday, October 5th.*—We negotiated the stiff climb, and McLeish, leaving me behind a rock on the summit, returned some distance to signal directions to the pony-man. He came back just as the stag returned roaring down the pass he had ascended; and as the mist was blotting out the landscape, I feared he would come right on to us without being seen, but, as luck would have it, he stopped and recommenced bellowing within seventy yards. I never heard a stag make such a row, but nothing of him could we see. It was most exciting, lying flat on a slab of rock, hoping devoutly that the mist would rise, if only for a few seconds. The tension had grown extreme, when there was a momentary lift in the gloom, and I made out the dim forms of the deer just as a big hind, which I had not noticed, 'bruached' loudly within twenty yards of us. The outline of the stag was barely visible when, after carefully aiming, I pressed the trigger, knowing that a moment later there would be no second chance. At the shot the deer at once disappeared, but I felt sure I had hit him, and, on following the tracks for some fifty yards, there he lay as dead as a door-nail. Weight, 13 stone 6 lbs.; a wild head of ten points; thin, and evidently that of a deer on the decline."

In England the wild red deer are hunted with stag-hounds on Exmoor, and first-rate sport is obtained on the great moorlands of Somerset and Devon. During the last fifty years the deer have much increased in numbers, and no less than three packs—the Devon and Somerset, Sir John Heathcoat-Amory's, and Mr. Peter Ormrod's—are now engaged in hunting them In the five years ending in 1892, 276 deer were killed by the Devon and Somerset hounds.

Wild deer are much given to fighting during the mating season. This is evidenced by the number of pairs of dead deer formerly found with their antlers tightly interlocked. However, deer often make playful tests of strength by pushing each other with their antlers, and in this way also such casualties may have occurred.

The young of the red deer are in Europe usually dropped in June. The fawn is dexterously concealed by the hind amid the heather, and is left in concealment during the day. Scrope, a great authority on these animals, states that the hind induces her fawn to lie down by pressure of the nose: "It will never stir or lift up its head the whole of the day, unless you come right upon it, as I have often done; it lies like a dog, with its nose to its tail. The hind, however, although she often separates herself from the young fawn, does not lose sight of its welfare, but remains at a distance to windward, and goes to its succour in case of an attack of the wild cat or fox, or any other powerful vermin."

On the Continent far finer examples of red deer are to be found than in the British Isles, and the antlers and records of weights preserved at the Castle of Moritzburg in Saxony, and elsewhere, show that two hundred years ago the stags of Germany were far superior even to those of the present day, which are much heavier and afford finer trophies than do the Highland red deer. Even in Germany, however, marked deterioration has taken place during the last two centuries. A stag, for example, killed by the Elector of Saxony in 1646 weighed not less than 61 stone 11 lbs.; while from the Elector's records between 1611 and 1656 it appears that 59 stags exceeded 56 stone, 651 exceeded 48 stone, 2,679 exceeded 40 stone, and 4,139 exceeded 32 stone. These figures are given by Mr. W. A. Baillie-Grohman, a distinguished sportsman, in a very interesting chapter contributed to the "Big Game Shooting" volumes of the Badminton Library.

This deterioration among the red deer of the forests of Central and Northern Europe is, however, not traceable among the red deer of the wild mountainous regions of Austria-Hungary

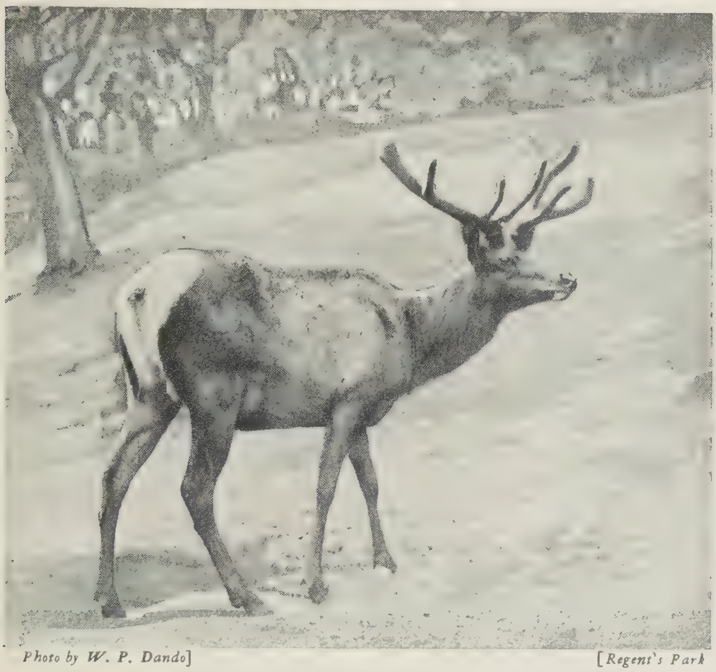


Photo by W. P. Dando] [Regent's Park

ALTAI WAPITI

This is one of several Asiatic forms of the wapiti

and South-eastern Europe. Here, at the present day, stags of enormous size and weight are still to be found. In the Carpathian Alps, for example, red deer stags are still to be shot scaling more than 40 stone (clean) in weight. Climate and feeding have, of course, much to do with the weight of stags and the size and beauty of their antlers. The Carpathian stags have enormous range, rich food, and, as Mr. Baillie-Grohman points out, are suffered during the summer to "make undisturbed raids upon the rich agricultural valleys . . . the feudal sway exercised by the great territorial magnates permitting the deer to trespass upon the crops with impunity, and thus grow to be the lustiest of their race."

In addition to the British Islands, the red deer of Europe is found on the Island of Hitteren, on the western coast of Norway, in the south of Sweden, and in Germany, Russia, France, Spain, Austria-Hungary, Turkey, and Greece.

In Corsica and Sardinia a local and smaller race is found, probably closely allied to the stag of North Africa. The BARBARY STAG is somewhat smaller than its first cousin of Europe, and carries antlers which usually lack the second, or bez, tine. The colour of this stag is "a dark sepia-brown, a little lighter and greyer on the back. Faint yellowish spots can occasionally be distinguished on the fur in the adults," says Sir Harry Johnston. The hinds are of the same colour as the stags, but lack the grey tint on the back. These fine deer are found in Algeria and Tunis, their habitat being chiefly in pine and cork forests. They are found also in parts of Morocco, near the frontiers of Algeria and Tunis, where their range extends from near the Mediterranean to the verge of the Sahara Desert. Formerly the Barbary stag was hunted by the Arabs on horseback by the aid of greyhounds. In Tunis, where it is protected by the French, it is now fairly abundant.

THE MARAL AND KASHMIR STAG

The CASPIAN RED DEER, or MARAL, is a magnificent sub-species, incomparably the finest representative of the red deer species. Standing about 4 feet 6 inches at the shoulder, a good stag will weigh as much as 40 stone clean, in exceptional specimens probably a good deal more. The range of this noble beast includes the Caspian provinces of North Persia, Transcaucasia, the Caucasus, and the Crimea. There can be little doubt that the great stags shot in the Galician Carpathians are Caspian red deer, and not the ordinary red deer of Western Europe. The red deer of Turkey is, too, no doubt referable to this sub-species.

Continuing our survey of typical deer, we come to the KASHMIR STAG, which is a magnificent beast, standing as much as 4 feet 4 inches at the shoulder, and carrying antlers approaching the red deer type, which measure in fine specimens from 45 to 48 inches. The Kashmir stag, often miscalled Barasingh by Indian sportsmen, makes its home in the forest regions of the north side of the Kashmir Valley, ranging chiefly on altitudes of from 5,000 to 12,000 feet.

WAPITI.

WAPITI are giants of the red deer group, carrying large antlers and often attaining 1,000 lbs. in weight. In America they are known as Elk.

In recent years it has been discovered that wapiti are also denizens of certain parts of Asia. At least two sub-species — the ALTAI WAPITI and the MANCHURIAN WAPITI — have thus far been identified. The former, sometimes known as the Thian-shan Stag, is found in the forests of the Altai and Thian-shan Mountains, west of the Mongolian Desert. Compared with its American congener, it is inferior in stature, has shorter legs, a longer body, and proportionately larger antlers, though none have yet approached those of the longest American specimens. These splendid stags, of which living specimens have been maintained by the Duke of Bedford at Woburn, are captured alive by the Altai natives, and kept in domestication for the sake of their antlers, which are sold in China for purposes of medicine at as much as the value of $50 apiece.

The MANCHURIAN WAPITI, or LUEHDORF'S STAG, is a well-marked local race of the wapiti, which turns reddish in summer. It has received several names, and is well characterised by the form of its antlers. It has been kept alive in the Duke of Bedford's park at Woburn Abbey. It seems probable that the Siberian stags will eventually be referred to the wapiti group.

By permission of Professor Bumpus] [*New York*

A SPOTTED ORIENTAL DEER

One of the numerous Philippine species

BOKHARA DEER

A fine deer from Russian Turkestan is at present known as the BOKHARA DEER. It is said to resemble the shou of Northern Bhutan more than any other species, and, standing about 4 feet at the shoulder, is of an ashen-grey colour, tinged with yellow. A living specimen has been exhibited at Moscow, and it is believed that specimens in the collection of the Duke of Bedford belong to this form.

SIKAS

The SIKAS, as typified by the JAPANESE DEER, are a group of deer of moderate size, distinguished from the preceding assemblage by antlers of simpler type, each antler having usually four points, and lacking the second, or bez, tine. The coat is spotted with white, and white markings appear about the tail. The tail is much longer than in the red deer group. The Japanese deer, found in Japan and North China, is a beautiful creature, somewhat smaller than the fallow deer of Europe, having a coat of brilliant chestnut, thickly spotted with white in curious longitudinal markings. This is the summer pelage; in winter the colour changes to dark brown, and the spots mostly disappear. When in the velvet, the antlers are of a bright chestnut-red, with black tips, and at this season the bucks look their handsomest. A good head measures from 25 to 31 inches, and carries usually eight points.

The MANCHURIAN SIKA may be looked upon as a larger variety of the Japanese deer, with a somewhat darker coat.

Another closely allied form is the FORMOSAN SIKA, which bears a rather paler summer coat, and carries spots in its winter pelage. This deer is found on the mountains of the island from which it takes its name. The few antlers which have reached this country seem to indicate that in this respect this deer is inferior to the other sikas. The longest pair yet recorded measure not more than 19¾ inches.

The PEKIN SIKA, sometimes known as Dybowski's deer, is considerably larger in size than the rest of the group, standing well over 3 feet at the shoulder. The horns are large and rugged, and measure as much as 27 inches in length. The coat is thick and shaggy, and well adapted for life in a harsh climate. The habitat of this species is North-eastern Manchuria and the borders of Korea.

FALLOW DEER

FALLOW DEER are, perhaps, to English people, the most familiar of all the cervine race, forming as they do, in the semi-domesticated state, the adornments of many English parks. The flesh of this handsome deer furnishes the well-known venison of this country, and is perhaps the best-tasted of all deer-meat. A good fallow buck stands about 3 feet at the shoulder, and weighs (clean) about 150 lbs., though specimens have been shot weighing as much as 204 lbs. but this is exceptional. The horns are strongly palmated. Originally this deer was not indigenous to Britain, but is often said to have been introduced by the Romans from Eastern Europe.

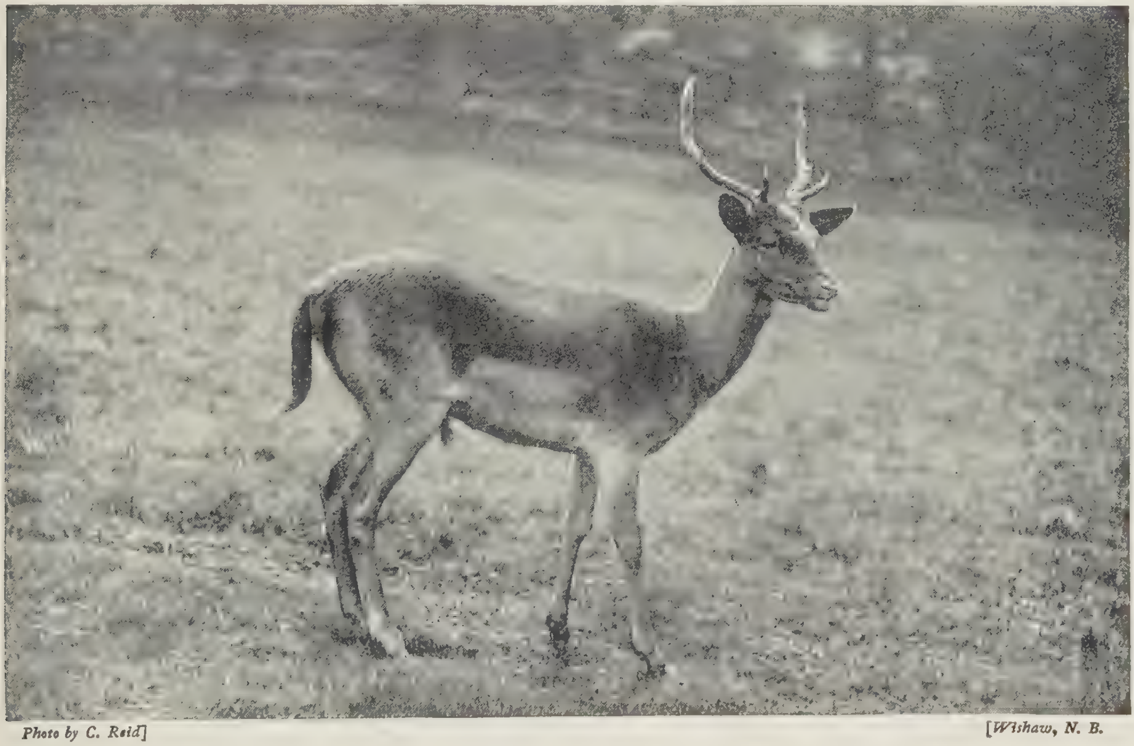


Photo by C. Reid] [*Wishaw, N. B.*

A YOUNG FALLOW BUCK OF THE BROWN BREED

The favourite park-deer of England

The COMMON FALLOW DEER is found in the wild state in Spain, Portugal, Greece, Austria, Rhodes, Sardinia, Asia Minor, and North Palestine. It is doubtful whether, as has been stated, this deer ever existed in modern times in the wild state in North Africa. This is a highly gregarious species, delighting to move in considerable herds. In some parts of Scotland fallow deer have reverted completely to the wild state, and afford excellent sport. And even park-deer, once they are shot at, exhibit extraordinary wariness and cunning, so much so that curious tricks and disguises have often to be resorted to when a fat buck has to be shot for venison.

The beautiful MESOPOTAMIAN FALLOW DEER, found in the mountains of Luristan, in Mesopotamian Persia, is somewhat larger than the common species, while its coat is much more brightly coloured. The antlers bear little resemblance to those seen in the park-deer of this country, being far less palmated and spreading, and more vertical.

The enormous horns of the extinct deer once known as IRISH ELK are now considered by naturalists to be those of a gigantic species of fallow deer. By the kindness of Mr. J. G. Millais, I am enabled to give the dimensions of a pair of antlers of one of these wonderful beasts from his museum. These antlers measure in spread, from tip to tip, 9 feet 4 inches; length round inside of right horn, 6 feet; round left horn, 5 feet 8 inches,—a marvellous trophy, truly. This specimen was dug up in County Waterford. These colossal fallow deer, which roamed the wastes of Ireland in prehistoric times, must have afforded fairly exciting sport to the feebly armed human beings who then existed.

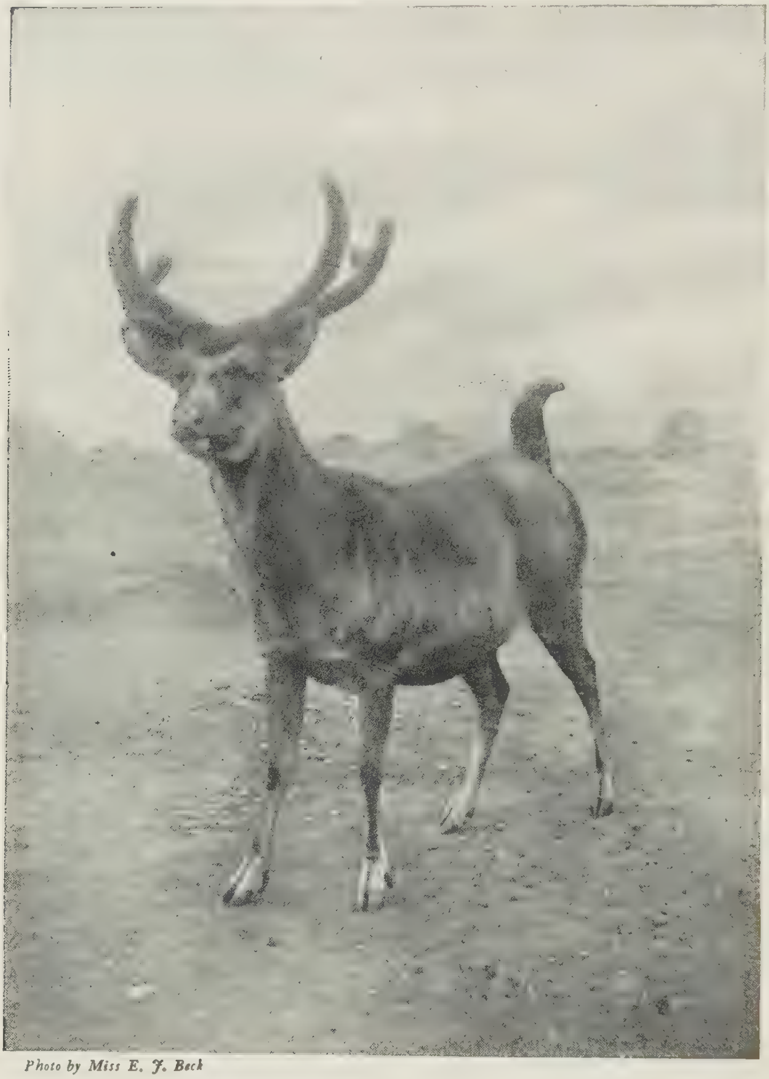


Photo by Miss E. J. Beck

A SAMBAR STAG

The only Indian deer of which the fawns are unspotted

THE SAMBAR, OR RUSINE DEER

SAMBAR may be shortly described as large deer, having rough, shaggy coats, and big, rugged antlers of simple type, usually displaying but three tines. They belong to the group known as Typical Deer, although they are but distantly connected with the red deer. The colour of the coat is usually dark umber-brown, marked with chestnut about the rump and under-parts. The well-known sambar of India stands as much as 5 feet 4 inches at the withers, and weighs, before being cleaned, some 600 lbs. The longest pair of antlers yet recorded (Rowland Ward's "Records of Big Game") measure 48 inches in length over the outer curve. Usually to be found among jungly, wooded hills and mountains in many parts of India and Ceylon, this fine stag affords first-rate sport, and is much sought after by shikaris. It is to be met with in small troops of from four to a dozen, or singly, while during the rutting-season the animals rove in more considerable herds. In jungle and thickly forested regions it is a hard matter to come up with the sambar on foot, and it is there usually shot from elephant-back, by the aid of beaters. In more open hill country it affords good stalking. In Ceylon it is hunted with hounds, and yields in this way also capital sport. These animals seem to revel in heat, and love to shelter themselves in hot, stifling valleys; they drink only once in two or three days. It is a noticeable feature in connection with the antlers of the sambar that they are not invariably shed annually, as with most of the deer kind. In Ceylon, according to Sir Samuel Baker, they are shed "with great irregularity every third or fourth year."

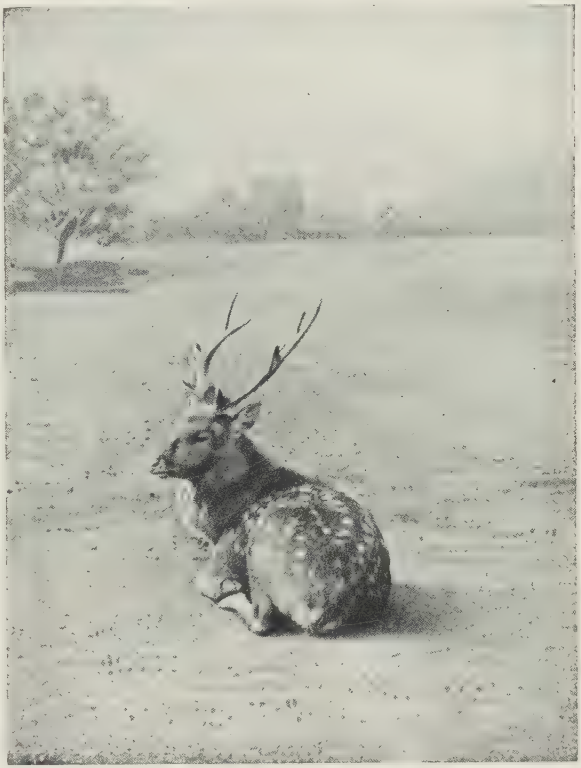


Photo by Miss E. J. Bach

FORMOSAN SIKA STAG

Like its Japanese kindred, this deer is spotted only in summer

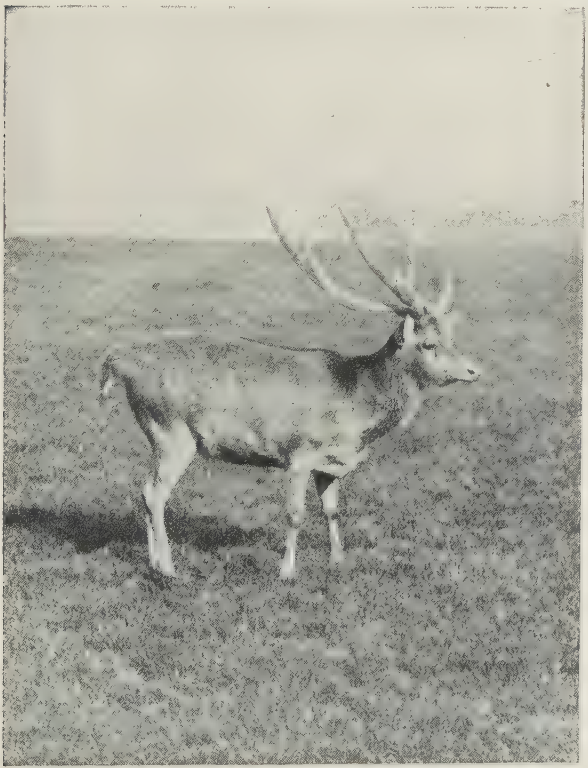


Photo by the Duchess of Bedford]

JAVAN RUSA STAG

This deer is a near relative of the sambar, but has a somewhat differ type of antler

Lieutenant-Colonel Reginald Heber Percy thus writes concerning the sambar, or sambur: "Compared with the Kashmir stag, red deer, or wapiti, he looks like an ugly, coarse, underbred brute. . . . As the sambur is almost entirely nocturnal in its habits, it is most commonly shot in drives, and in many places it is almost impossible to obtain sambur otherwise; but where it can be managed, stalking is, of course, far better fun. The sportsman should be on his ground just before daylight, and work slowly through the forest at the edge of the feeding-grounds, taking the bottom of the hill if there are crops on the plain below, or, failing these, the edges of the open glades in the forest. Presently, if there are any sambur about, he will hear their trumpet-like call, and, creeping on, see two or three dark forms moving among the trees. In the grey of the morning it is often very hard to distinguish a stag from a hind, and the writer has on several occasions had to wait, after viewing the herd, till there was light enough to pick his stag. Even in broad daylight it is difficult to judge the size of a stag's horns as he stands motionless in the deep gloom of the forest, and what little can be seen

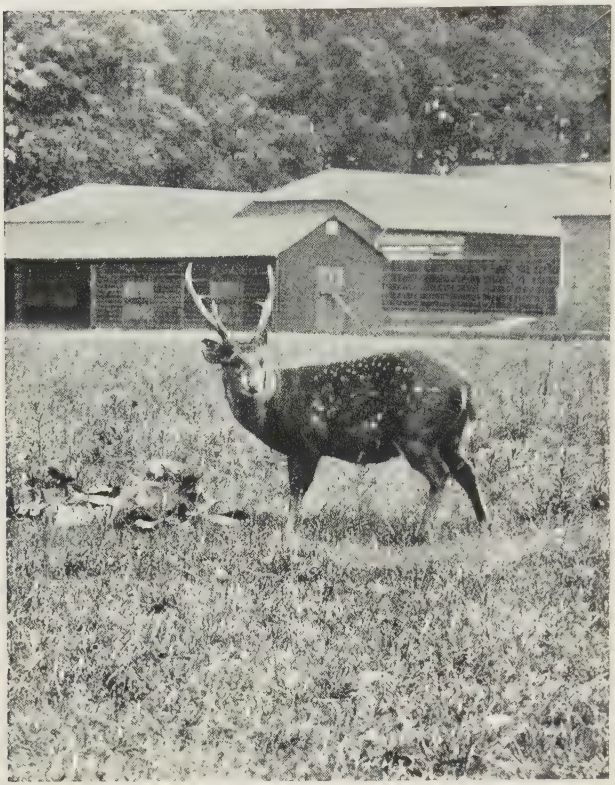


Photo by the Duchess of Bedford] [*Woburn Abbey*

HOG-DEER

The smallest Indian representative of the sambar group

of them makes them look three times their real size — the beam is so massive and the tines so long. The stag, too, is such a big beast, standing nearly a hand taller than a barasingh, that if seen in the open he looks as big as the Irish elk. . . . All driving should be done during the heat of the day, when the animals are lying down; trying to drive when beasts are naturally on the move generally results in the game leaving the beat before the men are in their places. It may sound ridiculous for a man to get up a tree in a sambur drive, but he is far more likely to get an easy shot in this position, as the deer will neither see nor wind him; he commands more ground, and he runs no risk of heading back the wary old hind which often leads the herd, the chances being that if he is rightly posted the herd will come right under his tree. Another advantage is that, his fire being plunging, he can shoot all round without danger to the beaters. In some parts of the Himalaya native shikaris declare that they often shoot sambur by selecting a likely path and improvising a salt-lick, after the fashion of Laplanders when they want to catch their tame reindeer." The flesh of this deer is coarse and only moderately good eating.

The Malayan Sambar, found from Assam, through Burma, to the Malay Peninsula, and in Siam, Hainan, Borneo, and perhaps Sumatra, is slightly less in size than its Indian prototype; the antlers vary somewhat, and are shorter and stouter. The longest antlers yet recorded measure 30⅞ inches over the outer curve; these come from Borneo.

The Formosan Sambar, sometimes called Swinhoe's Deer, is, again, closely connected with the Malayan sambar, and may be looked upon as purely a local race. The antlers appear to run smaller, the best recorded examples only extending to 19¾ inches.

The Luzon Sambar (Philippines), a small sub-species, and the Szechuan Sambar (North-west China), are also local races of the same species. This last seems thus far to occupy the most northerly habitat of this group.

The Basilan Sambar (Philippines) is, like its congener of Luzon, a small sub-species, standing no more than from 24 to 26 inches at the shoulder, of slender build, and with the hindquarters higher than the withers. The best antlers yet recorded measure no more than 15½ inches. It is interesting to note that as the island of Basilan is the smallest of the Philippines, so is this sambar by far the smallest of its group. Its restricted habitat has no doubt conduced, during long ages, to bring about this result.

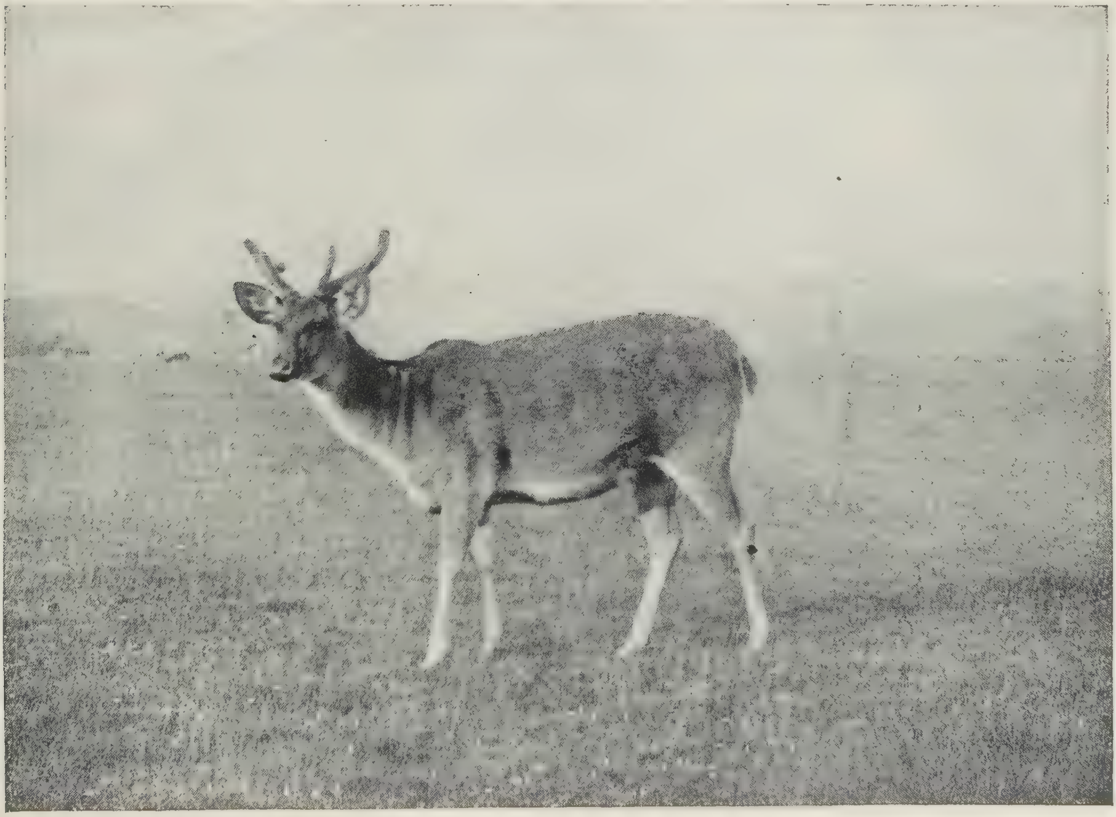
The Javan Sambar, or Rusa, is a distinct species, found, as its name implies, in the island of Java. The antlers are somewhat slender, but are, next to those of the sambar of India, the longest of the group. The best recorded pair measure 35½ inches, while another pair from Mauritius, where this animal has been introduced, measure half an inch longer. This sambar is smaller than the great sambar of India, and is about on a par with a good red deer.

The Moluccan Rusa, a sub-species somewhat smaller than the Javan deer, is found in

Celebes and certain islands — Boru, Batchian, and Amboina — in the Moluccan group; while the TIMOR RUSA, a closely allied congener, is found on the islands of Timor, Semao, and Kambing. It is possible — nay, even probable — that the Malays may, in times gone by, have introduced certain of these rusine deer from one habitat to another. Such, at least, seems to be the presumption among naturalists.

Dr. Guillemard, in that charming book "The Cruise of the Marchesa" (p. 357), gives some interesting information concerning Moluccan sambar in the little-known island of Batchian. The inhabitants, "living for the most part in the hills, kill and smoke the deer, and bring the meat into the villages for sale. We were fortunate enough to assist at one of their hunts, in which no other weapon than the spear is used. The side of a large ravine, which had been partially cleared, and presented a confused jumble of fallen trees and low brushwood, was assigned to us as our post, and, from the extensive view it commanded, we were able later in the day to watch one run almost from start to finish, although at first the sport appeared to be successful in every direction but our own. At length a stag broke covert about five hundred yards above us, and descended the slopes of the ravine, but shortly afterwards turned and made for the forest again. He was met by some of the hunters and driven back; but the dogs were now in full cry, and pressed him hard, the hunters meanwhile racing at their utmost speed above, in order to prevent his regaining the jungle. He now altered his direction, and turned down once more towards us; but the fallen trees were so thick that the dogs gained rapidly on him. He made one more effort for his life by doubling, but it was too late, and in another minute the dogs and hunters had fairly run him down."

Deer were probably the earliest animals of the chase. Their bones are found in the cave-dwellings of prehistoric man, and some of the earliest efforts at drawing represent these animals



YOUNG MALE SWAMP-DEER

This species is the Barasingh of the natives of India. It is by no means addicted to swampy localities

INDIAN MUNTJAC

Sometimes called the Barking-deer. The Indian species stands only 2 feet high

OTHER TYPICAL DEER

So numerous are the typical deer that they are not concluded even by the long list of animals already enumerated. We proceed now to glance briefly at the remainder of this important group.

The PHILIPPINE SPOTTED DEER, or PRINCE ALFRED'S DEER, is a small but extremely handsome species, found in the islands of Samar and Leyte. The height is under 30 inches; the colour very dark brown, spotted with white, the under-parts, chin, and upper portion of the legs also white.

Another small cervine from the Philippine group is the CALAMIANES DEER, a darkish brown beast, found in the island of that name.

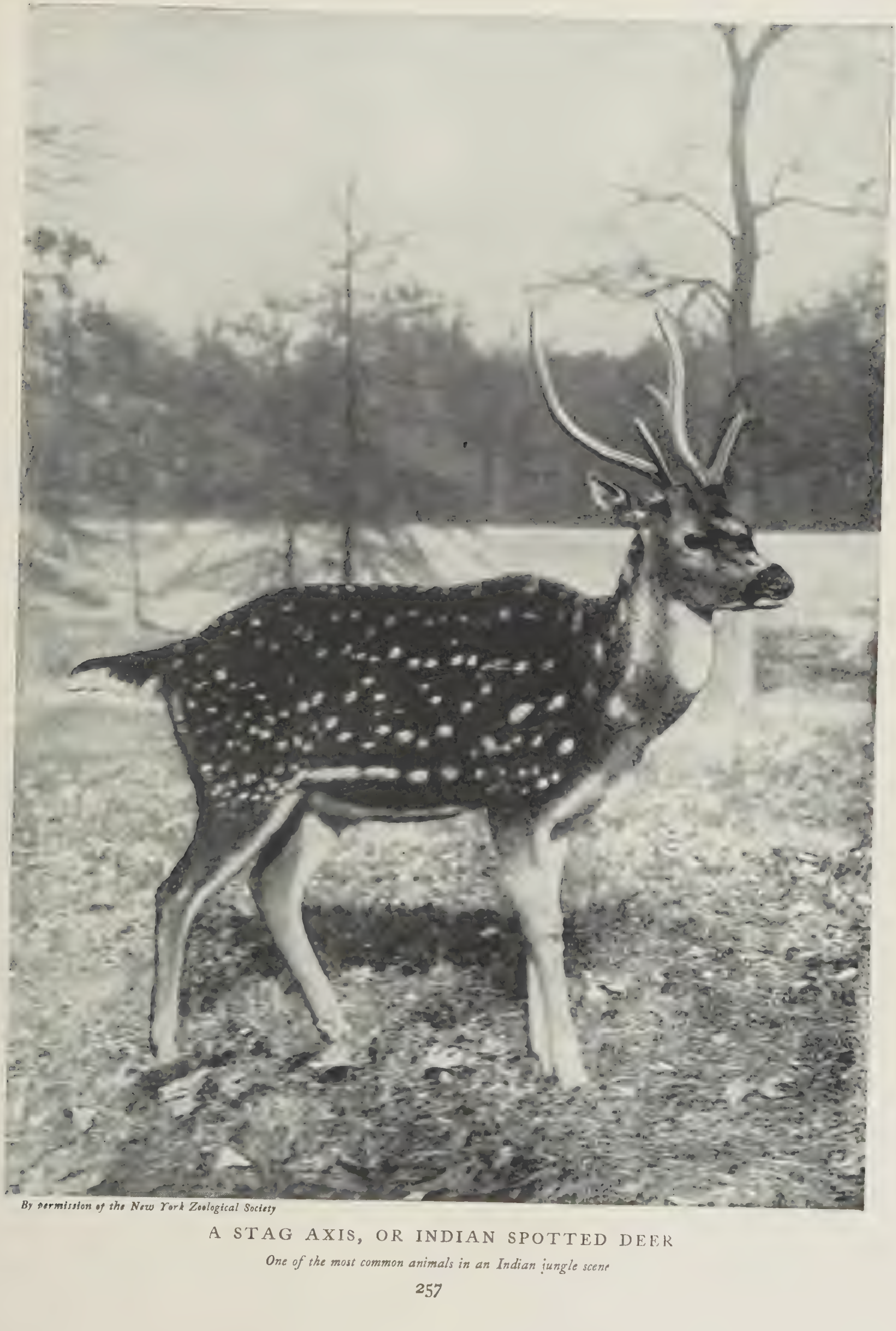
The little BAVIAN DEER, another island-deer, from the Bavian group, between Borneo and Java, should also be mentioned. Very little is known of the habits of these three deer, and few specimens even of their skins and horns have reached Europe.

The HOG-DEER, allied to the last-named species, is an animal much better known, found as it is in many parts of India and Burma. This handsome little deer stands from 24 to 28 inches at the shoulder, and carries antlers which average from 10 to 15 inches, and reach occasionally as much as 21 or 22 inches — one specimen is recorded measuring 23¼ inches. It has a yellowish or reddish-brown coat, minutely speckled with white. The summer coat is paler and marked with white or palish-brown spots. This sturdy little deer is found usually in long grass, and affords excellent snap-shooting; it is also run into with dogs and speared by mounted sportsmen. Major Fitz-Herbert thus describes a chase of this kind: "He [the little stag] stood at bay, with head down and bristles raised like a miniature red deer of Landseer's, but broke away when I came up. Once he charged the bitch and knocked her over. He stood at bay two or three times, but I could never get a spear into him for fear of hurting the dogs. At last one time, as he was breaking bay, I came up, and he charged me with such force as to break one of his horns clean off against the spear. However, I struck him in the spine, and rolled him over." These little deer have quite extraordinary pluck, and have been known even to charge and wound a horse.

The CHITAL, or INDIAN SPOTTED DEER, often called the Axis Deer, a very beautiful species, is the common jungle stag of India. Standing about 3 feet or a little over, its lovely coat of bright reddish fawn is thickly spotted with white at all seasons of the year. The horns are somewhat of the sambar type, and measure as much as 36 or 38 inches in length in fine specimens. These exquisite deer are often found in considerable herds, and are a forest-loving species.

YOUNG MALE CHINESE WATER-DEER

One of the few deer which have no antler



By permission of the New York Zoological Society

A STAG AXIS, OR INDIAN SPOTTED DEER

One of the most common animals in an Indian jungle scene

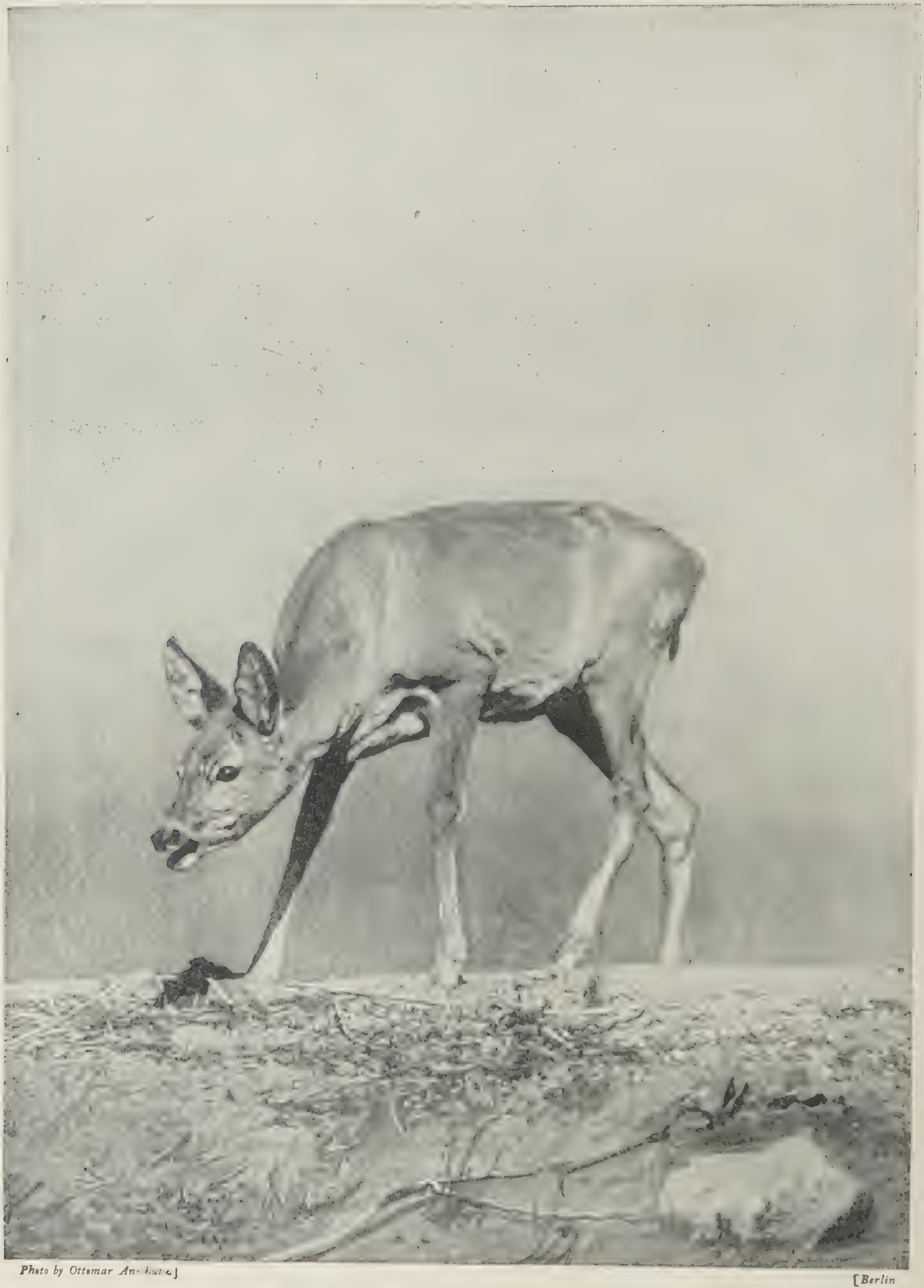


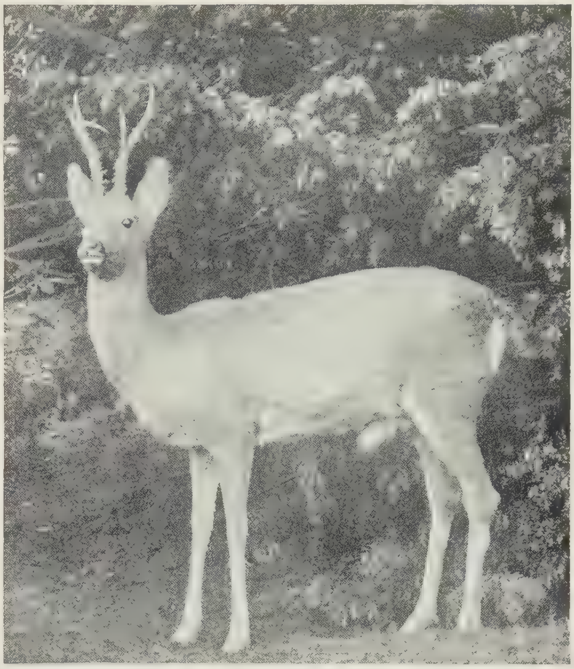
Photo by Ottomar Anschütz] [*Berlin*

FEMALE EUROPEAN ROE DEER

Though common in the Scotch woods, these deer are rarely seen, keeping close in cover all day

The SWAMP-DEER, the true Barasingh of India, as distinguished from the Kashmir stag, which is often loosely called Barasingh, is a plain-loving species, found in various parts of India, and characterised by handsome antlers, bearing as many as from 10 to 16 points. This is a big, heavy deer, standing nearly 4 feet at the withers, and weighing as much as 560 lbs. The summer coat is light rufous, more or less spotted with white. The winter coat is yellowish brown. A near relative to this deer is SCHOMBURGK'S DEER, found in Northern Siam. The antlers of this stag are most curiously forked and bifurcated.

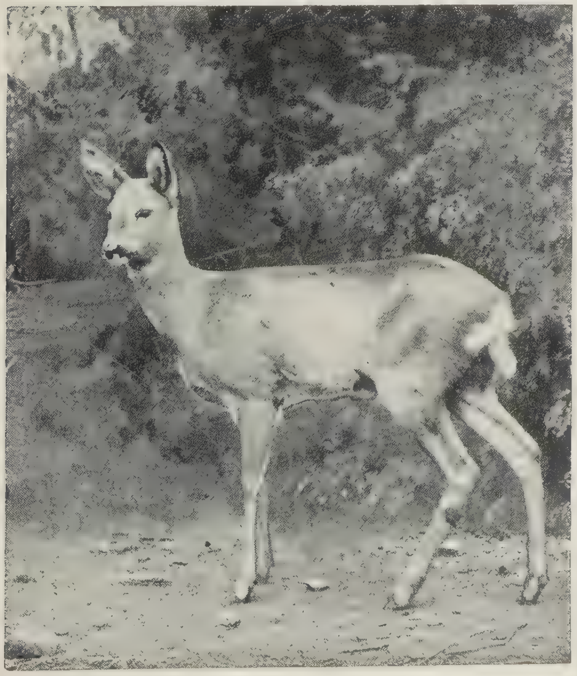
The THAMIN, or ELD'S DEER, sometimes called the Brow-antlered Deer, is another plains-deer, found chiefly from Manipur, through Burma, to the Malay Peninsula. It is a good-sized species, standing about 3 feet 9 inches at the shoulder, and weighing as much as 240 lbs. The large antlers are simple in type, the brow-tines curving down curiously over the forehead; the tail is sharp, and the neck provided with a mane, the young being spotted. A Siamese race of Eld's deer, found in Siam and Hainan, differs somewhat from the Burmese type.



MALE SIBERIAN ROE

A very large species of roebuck, with more rugged antlers than the European roe

THE MUNTJACS



FEMALE SIBERIAN ROE

The absence of a tail, characteristic of all roes, is well shown

The MUNTJACS, or BARKING-DEER, are a group of small deer found in India, Burma, and the Malay region. The INDIAN MUNTJAC stands about 2 feet in height, and weighs some 28 lbs. The antlers, which average 5 or 6 inches in length, bear two points — brow-tine and beam; the lower portions, or pedicles, are curiously covered with hair, and the front of the face is ribbed or ridged in V fashion. The general colour is a golden bay, the face and limbs brown, and the lower parts white. The buck has sharp tusks in the upper jaw, and, at a pinch, knows how to make use of them. A shy, stealthy little creature, the muntjac loves dense cover, and the sportsman usually obtains but a quick snapshot at this active and wary little deer as it flashes across him much as does a bolting rabbit scuttling across a narrow drive. Local Indian names for the barking-deer are Jungle-sheep, Red Hog-deer, and Rib-faced Deer. Other muntjacs, varying somewhat from the Indian form, are the HAIRY-FRONTED, the TENASSERIM, the TIBETAN, and the CHINESE MUNTJACS.

By permission of Herr Carl Hagenbeck] [*Hamburg*

SIBERIAN ROEBUCK

Shows a magnificent pair of antlers

Tufted Deer

Near relatives of the odd little muntjacs are the Tufted Deer, of which two species, the Tibetan and Michie's, are known to naturalists. The former, found in Eastern Tibet, is about the size of the Indian muntjac, and has a coat of dark chocolate-brown, curiously speckled on the face, neck, and fore parts; the frontal tuft is nearly black. The antlers of the bucks of both this and Michie's deer are extremely small, scarcely observable at a first glance. Both species have long curving tusks projecting from the upper jaw. Michie's tufted deer is of a greyish-black or iron-grey colour, the face and neck dark grey. This animal is found in the reed-beds bordering the Ningpo and other rivers in Eastern China.

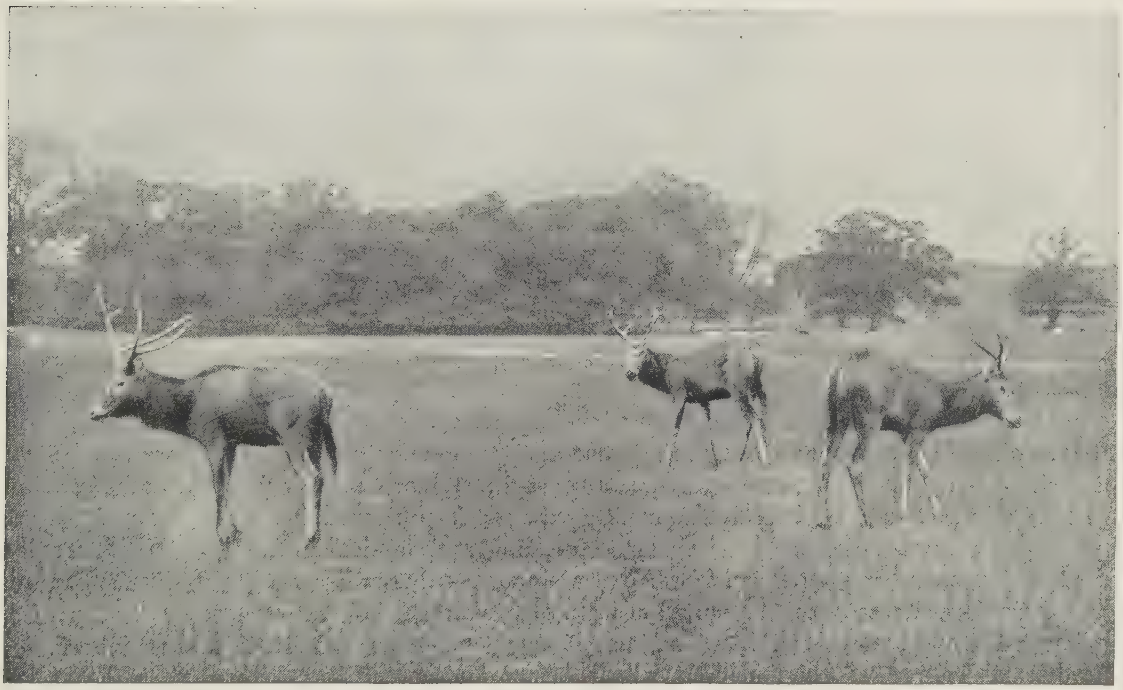
Water-deer

The Chinese Water-deer is another diminutive deer, standing no more than 20 inches at the shoulder. The body-colouring is pale rufous yellow, the head and the back of the ears being darker in hue than the rest of the body. The males carry no antlers. This tiny deer is found in North-east China, and is well known on the islands of the Yangtse-kiang River. It loves thick cover, especially reeds and long grass. So apt is it at concealment, that in one park, where specimens are kept in a paddock of long tussocky grass, hours may be spent without catching a glimpse of it. When disturbed, it scurries off with short, quick leaps, very much after the manner of the hare. The males of the Chinese deer, like the muntjacs, carry long curved tusks in the upper jaw.

Roe Deer

The European Roe, one of the handsomest of all the smaller deer, is still happily found in many parts of Scotland. In England, where it had at one time become well-nigh extinct, it has been here and there reintroduced with some success. In Ireland it seems never to have been found. On the Continent its range is wide, extending from the south of Sweden, through France and Germany, to Italy, Greece, Turkey, Austria-Hungary, and Spain. Found in Southern Russia and the Caucasus, it makes its way eastward as far as North Palestine and Persia. The roe stands, in good adult specimens, 26 inches at the shoulder, and weighs about 60 lbs. The handsome and very characteristic horns measure in good specimens from 10 to 13 inches over the outer curve. The summer coat of this beautiful little deer is a bright rufous brown; in winter a darker and duller brown, with a notable white patch about the tail. The roe is always more or less a wood-loving creature. In winter, especially, it seldom cares to quit the shelter of the forest; in summer, however, the deer wander into more open localities. The fawns are born generally towards the end of May, and two young are usually produced. In the rutting-season the males fight savagely with one another.

Mr. J. G. Millais gives an instance of a buck killed in one of these desperate battles, in which one antler of the victor, having penetrated the brain of the vanquished buck, had been broken clean off and remained embedded in the skull, firmly wedged between the ears and the antlers. "When wounded and brought to bay by a dog," says Mr. Millais, "a roebuck brings into play both head and fore legs in his defence, using his horns as described, and striking out with his legs, more as if to push off his antagonist than to cause a forcible blow, for he gives no shock, as a hind can. A doe, too, uses her fore legs and boxes with her head; and Mr. Steel, who has had wide experience in roe-shooting, tells me that he has seen a doe use her hind legs as well. The bark of the buck is loud, sharp, and deep in tone, not unlike what a single call might be from an old collie. At this season, too, the female gives an amorous call when she wishes the male to come to her. If he is within hearing, he puts his neck out straight and comes full speed to her. In Germany many roebucks are shot by alluring them in this manner, and calls exactly imitating her voice are made for the sportsman's use. One who has shot roe in this manner tells me it is most exciting sport, for the buck comes straight for the sound at full speed, and will only stop startled for a second when he discovers the fraud, and as often as not he passes right on without giving a chance."



PÈRE DAVID'S DEER

Nineteen of these deer are in England; three are at Berlin. It is believed that these are the only deer of this species in existence

Roe have a curious trick of chasing one another in play, and certain roe-rings in the woods near Cawdor Castle, according to Mr. Millais, demonstrate the fact that for ages the deer have been in the habit of disporting themselves in these strange circles over the same pieces of ground. The fact is very singular. "These curious circles are most used in early summer; and Sutherland, the head keeper, tells me," says Mr. Millais, "that hardly a morning passes without there being one or two roe playing in the rings, and sometimes there is quite a party of them." Roe feed chiefly on grass; they will eat also rowan (mountain-ash) berries, of which they are especially fond, as well as turnips, grain, heather tops, and various other roots and plants. Certain fungi, to which they are partial, they take much pains to dig out with their sharp hoofs. "A roebuck that I once kept," says Mr. Millais, "was a good Scotchman, though he had a beastly temper, for he liked nothing so much as oatmeal porridge." Roe make delightful pets, but the bucks are not to be trusted after the third year. One of these animals, supposed

GROUP OF VIRGINIAN DEER (TWO BUCKS, FOUR DOES)

These are the common deer of the Eastern United States

to be tame, has been known to kill a lad. In Scotland and on the Continent roe deer are usually killed by driving, and large bags are often made. Even within recent times, as many as sixty-five roebucks and thirteen hinds have been shot during a day's driving. Shot-guns are employed for this kind of sport. Stalking the roe is not so much pursued in Scotland as it might be. It is a first-rate and most interesting form of sport, and in certain districts the rifle might very well be substituted for the shot-gun. "Roe-stalking," says Mr. Millais, "possesses many charms of its own. In the first place, you can enjoy it at a season when there is no other shooting going on; secondly, it takes you out in the early morning, when all nature is full of life and beauty, and before the heat of the day commences; and, thirdly, where the chase of the animal is systematically conducted, as with red deer, the nature of the sport is everything that can be desired. I would therefore put forward a plea that tenants and owners of part-wood, part-forest lands in Argyll, Inverness, Ross, and Aberdeen should turn their attention to stalking the roe in preference to killing them during the usual winter wood-shoots." Roe deer are exceedingly abundant in the great forest regions of Germany and Austria-Hungary. In Austria alone, not including Hungary, during the year 1892, no less than 68,110 of these beautiful little deer were shot on various estates.

The SIBERIAN ROE, found from the mountains of the Altai and Turkestan to Siberia, is a somewhat larger species than its European cousin, measuring from 28 to 34 inches at the shoulder. The antlers are also larger, extending to as much as 16 and even 18 inches in measurement. As beseems its habitat, the coat of this species is also thicker and rougher than is the case with the European roe. Mr. Lydekker gives some interesting particulars regarding this animal: "When the snows of November fall, the roe themselves commence to collect in herds, which may number from 300 to 500 head, and soon after migrate southwards into Manchuria, whence they return about the end of March or beginning of April. On the Ussuri, which they must cross, they are at this season slaughtered in thousands by the hunters, without regard to age or sex."

One other species, the MANCHURIAN ROE, found chiefly in mountainous habitats, whence it never descends, should be noted. This is a smaller deer than the Siberian roe, and approximates in size and length of horn to the European race.

PÈRE DAVID'S DEER

This remarkable animal, which apparently bears little or no resemblance to any of the other deer of the Old World, has been placed by some naturalists between the roe deer and the American deer. Its habitat is North China, and, strangely enough, it seems to be unrecognised in the wild state, being apparently only known in China in the Imperial Park at Pekin. This deer approaches in size the red deer of Europe. The general colouring is greyish brown, white about the eyes, ears, rump, and under-parts; the horns, which lack the brow-tine, are very singular in shape, and measure as much as 32 inches in length; the tail is long, reaching to the hocks; the gait is "lolloping" and mule-like. This is a marsh-loving species, and at a certain park, where specimens are kept, "they may be seen wading far into the lakes and even swimming in the deeper water."

In South America are to be found several kinds of marsh-deer, of which the best known is the handsome Marsh-deer, having its range from Brazil to the forest country of the Argentine Republic. Little is known of this and other South American deer of similar species. The marsh-deer is almost equal in size to the red deer of Scotland, but somewhat less stout of build; the colouring is bright chestnut in summer, brown in winter; the coat is long and coarse, as befits a swamp-loving creature; the antlers usually display ten points, and measure in fine specimens as much as 23 or 24 inches.

The Pampas-deer, a species closely allied to the marsh-deer, is of small size, standing about 2 feet 6 inches at the shoulder. The antlers, usually three-pointed, measure no more than from 12 to 14 inches in fine specimens. This deer is found from Brazil to Northern Patagonia.

The Peruvian and Chilian Guemals are small deer, found on the high Andes, and are somewhat inferior in size to the Virginian deer. The males carry simple antlers forming a single fork, and measuring about 9 inches. The coat, yellowish brown in hue, is coarse, thick, and brittle. The Chilian guemal is found also in most parts of Patagonia; unlike its congener of Peru, which delights in altitudes of from 14,000 to 16,000 feet, its habitat lies chiefly in deep valleys, thick forest, and even the adjacent plains, to which it resorts in winter.

The Brockets, of which seven species are found in South and Central America and Trinidad, are small deer, having spike-like antlers and tufted crowns. The largest is the Red Brocket, found in Guiana, Brazil, and Paraguay, which stands 27 inches at the shoulder. The body-colouring is brownish red. Like most of the group, this brocket is extremely shy; although fond of dense covert, it is found also on open campos. The Pygmy Brocket, a tiny dark brown deer, less than 19 inches in height, found in Central Brazil, is the smallest of these very small deer.

Two other diminutive deer, known as Pudus, closely allied to the brockets, are found in South America. These are the Chilian and Ecuador Pudus, of which the former is no more than 13½ inches in height, the latter about 14 or 15 inches. Little is known of the history and life habits of these charming little creatures, one of which, the Chilian species, has occasionally been seen in Zoological Gardens.

The Musk-deer.

This brief account of the deer of the world closes with the Musk-deer, which differ from almost all others of their kind—the Chinese water-deer being the sole exception—in the absence of antlers. In place of these defensive and offensive weapons, nature has provided the musk-deer with long canine tusks, projecting downwards from the upper jaw. The musk, from which these curious deer take their name, is secreted during the rutting-season—in the male only—in a pouch or gland contained in the skin of the stomach.

The well-known Himalayan Musk-deer, is a stout, heavily made deer for its size, measuring 20 inches at the shoulder, about 2 inches higher at the rump, and having a coat of coarse, brittle hair of a dark brown colour. This musk-deer, which is nowadays by no means common, is found in the forests of the Himalaya, Tibet, Siberia, and Western China, often at altitudes of about 8,000 feet. These animals are extraordinary mountaineers, active, daring, and apparently quite unconscious of or indifferent to danger.

YOUNG MARSH-DEER

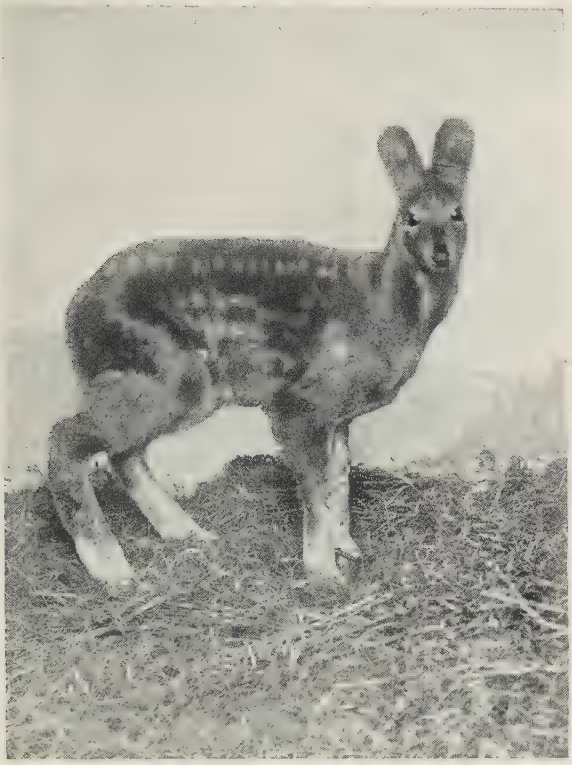
A very elegant South American species. The main colour is a bright chestnut, with the lower part of the legs black. The insides of the ears are filled with white hair, looking like silver filigree

A WORD should be said upon the subject of the acclimatisation of various members of the Deer Tribe in countries which are distant from their native ground, but in which they are found to thrive and breed, some with greater and some with less success. Several of the illustrations in this chapter are taken from deer living in natural conditions at an English country seat in Bedfordshire. Others were photographed out of doors in zoological parks or private menageries. There is a considerable degree of transferability among deer, not only among those found in temperate or northern regions, but also those which inhabit the tropical jungles of Southern India.

The Axis, or Chital Deer of India, is the most striking example. It lives in the hot jungles, where it is the usual food of the tiger. Yet it has been transferred to the forests of France and to English parks, and not only lives, but breeds and increases in numbers. In France and Germany herds of axis deer have been maintained long enough to observe a curious and noteworthy incident in acclimatisation. The axis deer breeds naturally in October, after the Indian rainy season. This habit, if persisted in in Europe, would expose the fawn to the rigours of the French or English winter. Gradually and after some time the herds become irregular in the time of reproduction, and later produce the fawns in June, at the time which is best suited to their survival. This is a real instance of acclimatisation.

The Japanese Deer, or Sika, was introduced into the park at Powerscourt by Viscount Powerscourt some thirty years ago. Now it is one of the commonest of recently introduced park-deer both in England and in France. The venison is excellent, and the herds are prolific. The stags are small, but very strong, and at Powerscourt always get the better of the red deer stags, and sometimes carry off their hinds. Wapiti Deer are kept in several English parks, but so far the Sambar has proved a failure. Hog-deer and Chinese Water-deer do very well both in England and France.

But it is in New Zealand that the best results have been obtained with imported deer. The English Red Deer, some of which were originally sent out by the Prince Consort reinforced by some of the same species bred in Australia, have become indigenous. They grow far faster and to a larger size than those on the Scotch moors, and rival the great stags of the Carpathians. The antlers also increase in size at an abnormal rate. Licences are regularly issued to stalk and shoot these deer, which, like the brown trout and the pheasant, are now among the stock of established wild fauna. Moose and a few Sambar stags and herds have also been turned out in New Zealand. The latter are said to be doing well.



YOUNG HIMALAYAN MUSK-DEER

The male carries a pouch on the abdomen, from which the musk is obtained. There are no antlers

There is no particular reason why the deer of cold countries should not be interchanged; they seem to have the natural adaptability of oxen. But it is not a little surprising that the species from warm climates should flourish in damp and cold ones. The axis deer would be a real addition to the fauna of the great European forests, if it is found that it survives the winter snows without some form of artificial shelter. No one seems to have considered the advisability of introducing the mule-deer into the Central European woods. It is a much finer animal than the fallow buck, and the venison is excellent. In these woods where fallow deer are preserved in a wild state, as on many of the German Emperor's sporting-estates, the mule-deer would be a far more ornamental animal. Few people know what immense herds of red and fallow deer, as well as of wild boars, still exist, under careful preservation, in the forests of the great German, Austrian, and Russian princes, and in the royal forests of their respective countries.

When the Kaiser holds his great Court hunting-parties, to which the guests all come dressed in the uniform of the Order of St. Hubert, as many as 200 deer are shot in a day. They are driven past the guns by beaters. After the day's sport is over all the antlers are wreathed with boughs of spruce fir, and the stags laid out like rabbits after an English battue.

It is rather surprising that only one species of deer has been entirely domesticated — *viz.* the Reindeer. Deer's meat is as highly prized as that of any other game, perhaps even more so. There is almost no part of the animal which is not useful. The horns are valuable for knife-handles, and always command a good price; they were prized even by prehistoric man, who converted them into pick-axes, and made spear-heads and daggers of them. The leather of the hide makes the softest and best of all hunting-garments: the American Indian or trapper always wears, or used to wear, a deer-skin shirt and deer-skin leggings, made as exquisitely soft as chamois leather by a process known to the squaws. At the present time all the best gloves are made of doe-skin; they are far the most costly of any gloves. Doe-skin breeches are also a luxurious garment to ride in. For ornamental rugs few skins beat those of the Dappled Deer, laid on the floor of some finely furnished hall or room.

Thus we have the curious spectacle of the wild men of the Far North, the Lapps and Ostiaks, taming and keeping in domestication great herds of deer, milking them, using them as beasts of draught, and feeding on their flesh, while far more civilised races in the South have not taken the trouble to do so. The reason is not easy to surmise, unless it be that the idea of making use of the Deer Tribe solely as beasts of the chase was so rooted in the European ruling races, and their kings and nobles, that the agriculturist never had a chance of trying to tame and use them for other purposes. It is certain that during the Middle Ages law and custom made any such attempt quite impossible. The deer were a valuable sporting asset, so hedged round with an atmosphere of feudal privilege, that to convert them into something useful to the common people would have been regarded as an insult to the powers that were.

CHAPTER XVIII

THE CAMEL TRIBE AND THE CHEVROTAINS

BY W. P. PYCRAFT, A.L.S., F.Z.S.

A WHITE CAMEL

A light sandy is the common colour, though white, grey, brown, and black occur; but black camels are held by the Arabs to be worthless

THE Camels and Llamas, constituting the present group, form a very distinct section of the great assemblage of animals known as the Ruminants, or Cud-chewers. The Camel Tribe are peculiar amongst the Ruminants in that they never possess horns, and in that the stomach is only divided into three instead of four compartments — this division into compartments being intimately connected with the ruminating habit. Furthermore, the upper jaw bears cutting-teeth, or "front teeth," as they are popularly called: though the full set (three pairs) is only complete in the young, in the adult but one pair remains, the others being shed. The canine or "eye" teeth are also peculiar in their position, those of the lower jaw being separated from the cutting-teeth by a very considerable gap.

In the structure of the feet the Camel Tribe are no less peculiar; indeed, it is on this character that the scientific name of the group is founded. Only two toes are present; these are of equal size, and, instead of being protected by hoofs, are provided with a hardened skin, covering a cushion-like pad, which expands when the weight of the body is thrown upon the foot, as in walking. This is an admirable adaptation for walking on soft and yielding sands. Hoofs are represented only by a pair of broad nails.

The three-chambered stomach is remarkable because the chamber known as the "paunch" lodges in its walls a large collection of "water-cells," in which can be stored as much as a gallon and a half of water. This faculty of storing water is invaluable to an animal which has often to subsist for days on absolutely waterless deserts.

Note the slit-like nostrils in the illustration of the Bactrian Camel on page 306. These can be closed at the will of the animal, a useful precaution against the entrance of sand during the violent sand-storms which often arise in the desert.

The True Camels are distinguished by the possession of a hump or humps: there are never more than two. It is in these humps that the camel was popularly supposed

Photo by Charles Knight

ARABIAN CAMEL

This individual belongs to the heavy breed employed for carrying merchandise and baggage to store water; in reality they are huge masses of fat, serving as a reserve store of food. The accumulation of fat for this purpose is a common feature amongst the Mammalia. Most animals which hibernate, or lap up and sleep during the winter, store up fat; but, except in the camel, it is distributed more or less evenly over the body. With hard work or bad feeding the camel's hump dwindles almost to nothing. When on the eve of a long journey, the Arab looks anxiously to the state of this hump, for on the size of this depends the animal's condition and ability to undertake the march.

The Arabian camel as a wild animal has long since been extinct. Of the hordes of so-called wild camels which abound in the desert regions of Central Asia (Gobi Steppe), some are probably descendants of domesticated animals which have escaped from captivity, but others may be aboriginally wild. From the evidence of fossil camels, there seems little doubt that this animal originated in North America—one branch of the family (the Llamas) migrating into South America, and the other (the Camels) crossing Bering Sea into the Old World.

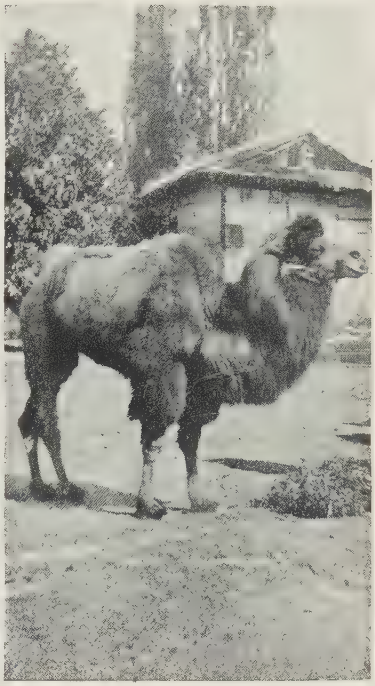


Photo by York & Son

A CAMEL

A half-breed between the Arabian and Bactrian species

THE TRUE CAMEL

Before proceeding further, it may be well to refer to the confusion which exists in the use of the names Camel and Dromedary. The latter name seems popularly to be applied to the two-humped species, the name Camel being reserved for the one with a single hump. This is a mistake. The DROMEDARY is a swift breed of riding-camel of the one-humped species, and is so called to distinguish it from its slower brother, the Pack-camel, or

A STRING OF CAMELS NEAR PORT SAID

These are the typical desert camels of the East

Baggage-camel. The pack-camel, it is interesting to note, has been introduced into Australia, where it has proved invaluable in crossing the vast waterless deserts, on account of its power to exist for long periods without drinking.

The TRUE or ARABIAN CAMEL is found in a domesticated state in Africa and Asia, and, as we have just indicated, belongs to the one-humped species. It is a long-limbed, short-haired animal, standing as much as 7 feet high. As a wild animal it is extinct. Much mystery, indeed, surrounds the question of its origin. It has been suggested that the Arabian camel, or its immediate parent, may have sprung from an Indian ancestor, and thence made its way through Arabia and Syria into Northern Africa.

HEAD OF BACTRIAN CAMEL

The hair of this species is used to felt into material for tents. It is longest on the top of the head, neck, humps, and parts of the fore limbs

Not only is the camel indispensable as a beast of burden, but it is esteemed also for its hair, its flesh, bones, and milk. The hair is woven into cloth. In some parts of India the bones are used instead of ivory for inlaid work. The milk is unusually thick and rich, so much so that it cannot be used for tea or coffee, as it curdles when mixed with either.

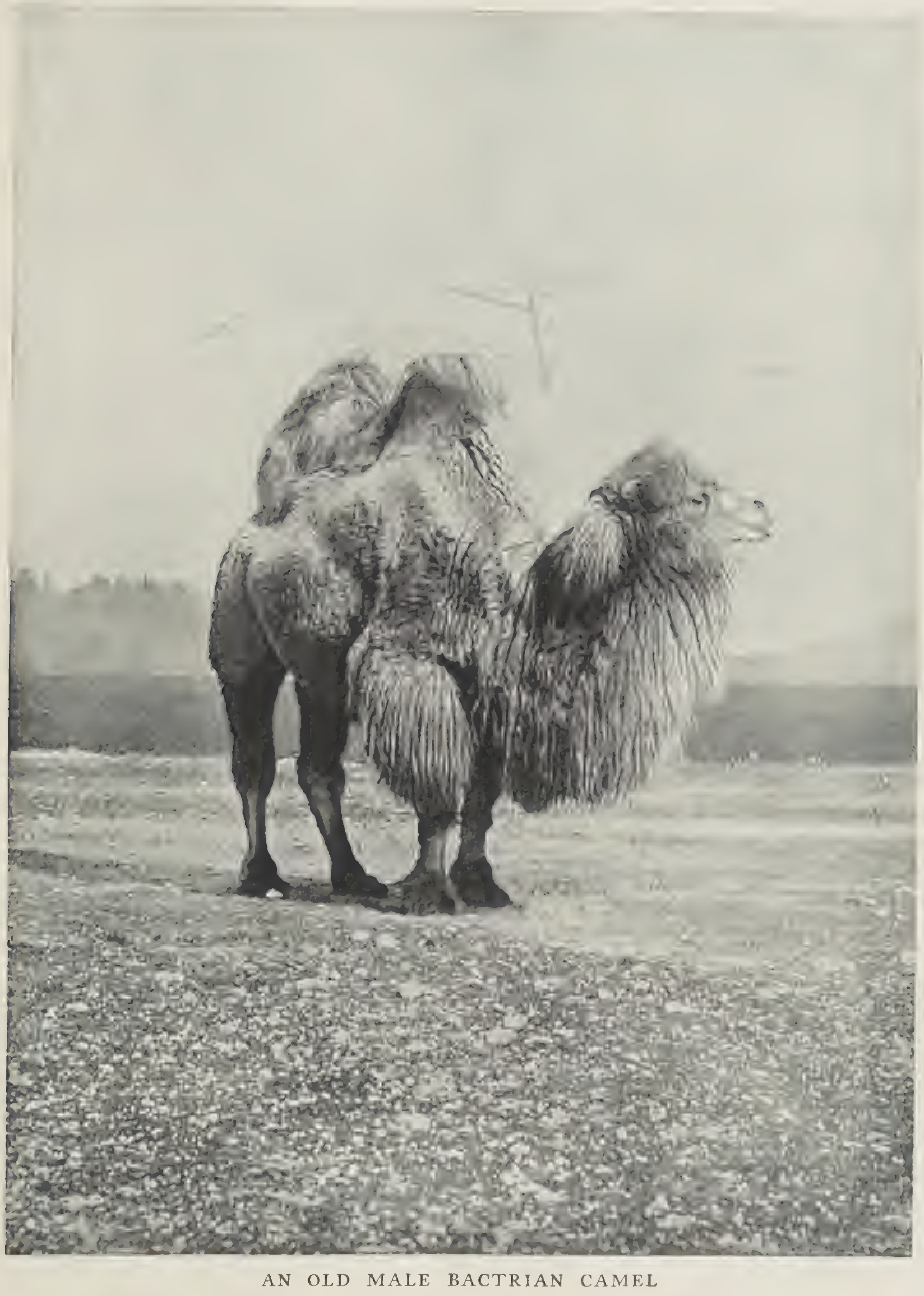
The camel is popularly supposed to be a very docile animal; but those who speak from experience declare it to be stupid, surly, and vicious to the last degree. It is, however, not entirely void of understanding, and apparently cherishes feelings of revenge, as the following story shows: "A camel, working in an oil-mill, was severely beaten by its driver. Perceiving that the camel had treasured up the injury, and was only waiting a favourable opportunity for revenge, he kept a strict watch upon the animal. Time passed away; the camel, perceiving it was watched, was quiet and obedient, and the driver began to think the beating was forgotten, when one night, after the lapse of several months, the man was sleeping on a raised platform in the mill, whilst the camel, as is customary, was stabled in a corner. Happening to awake, the driver observed by the bright moonlight that, when all was quiet, the animal looked cautiously round, rose softly, and, stealing towards a spot where a bundle of clothes and a bernous, thrown carelessly on the ground, resembled a sleeping figure, cast itself with violence upon them, rolling with all its weight, and tearing them most viciously with its teeth. Satisfied that revenge was complete, the camel was returning to its corner, when the driver sat up and spoke. At the sound of his voice, perceiving the mistake it had made, the animal was so mortified at the failure and discovery of its scheme, that it dashed its head against the wall and died on the spot."

It is said that when camels pass a mounted man in a narrow path they will turn their heads suddenly round and endeavour to inflict a bite on the rider's arm or shoulder. This is naturally much dreaded, as a camel's bite is particularly severe.

Much care has been spent in the breeding of the camel. "In the Sahara Desert," says Canon Tristram, "the Tourareg is as careful in the selection of his breeding mahari (a fine race of the dromedary) as the Arab is in that of his horse. The pedigrees are handed down, and many a dromedary can boast a genealogy far longer than the descendants of the Darley Arabian" (page 202).

THE BACTRIAN CAMEL

This species is often called the Dromedary; but, as we have already remarked, this is an error. The dromedary is a swift breed of the Arabian camel. The BACTRIAN CAMEL may be



AN OLD MALE BACTRIAN CAMEL

This animal is a magnificent representative of the two-humped species, so widely distributed in Central Asia

Photo by Charles Knight]

BACTRIAN CAMEL

The most useful transport animal of Central Asia

distinguished from its Arabian relative by the fact that it has two humps, is shorter in the leg and heavier, and has longer hair and stouter and harder feet. The shorter legs are distinctly advantageous, enabling the animal to get about with ease and safety over rocky and hilly ground.

The hordes of wild camels found in Turkestan, in the neighbourhood of Kashgar, are believed by Major C. S. Cumberland to be descended from camels which escaped when the district known as Takla Makan was buried in a great sand-storm 200 years ago. From the fury of that storm it is said no human being escaped alive. Some camels apparently did, perhaps owing their survival to the power they possess of closing the nostrils, and thereby keeping out the sand.

The Bactrian camel lives upon the salt and bitter plants of the steppes, which are rejected by almost all other animals. It is further able to drink brackish water from the salt lakes by which it is surrounded. When pressed by hunger, it will even eat felt blankets, bones and skins of other animals, and fish!

YOUNG BACTRIAN CAMEL

The two humps are just beginning to grow

THE LLAMAS

The Llamas are humpless camels, and confined to the western and southernmost parts of South America. Two wild and two domesticated species are known. The name Llama, it should be mentioned, properly belongs to the domesticated animal of that name.

The Vicuña

This is the smaller of the two wild species. Vicuñas live in herds in the mountain-ranges of Peru, dwelling during the wet season high up amid rocks and precipices, near the region of perpetual snow. In the dry season they descend to the higher valleys. Their capture is a matter of great difficulty; for, apart from the inaccessible nature of their haunts, they are exceedingly shy and vigilant. They are clothed in a woolly coat of extremely delicate texture, much in demand for weaving purposes.

The baby vicuña, it is interesting to note, is able to run swiftly directly after its birth, and possesses great powers of endurance. This is the more noteworthy since the young of the camel are exceedingly helpless.

Vicuñas are hunted by the Indians and captured by driving them into an enclosure of perhaps half a mile in diameter. This is hung round with bits of coloured rag, which, fluttering in the wind, appear to deter the captives from breaking through.

The Guanaco

This is larger than the vicuña, and is described as an elegant animal, being possessed of a long, slender, gracefully curved neck and fine legs. It ranges from the highlands of the Andes to the plains of Patagonia and the islands of Tierra del Fuego. As Mr. Darwin points out, the behaviour of guanaco when alarmed is very contradictory. At one time they will sound the danger-signal, and put themselves out of harm's way long before the enemy has perceived them; at another they exhibit the most extraordinary curiosity, and pay the death-penalty in consequence. "That they are curious is certain; for if a person lies on the ground and plays strange antics, such as throwing up his feet in the air, they will almost always approach by degrees to reconnoitre him. It was an artifice that was repeatedly practised by our sportsmen with success, and it had, moreover, the advantage of allowing several shots to be fired, which were all taken as part of the performance. On the mountains of Tierra del Fuego, I have more than once seen a guanaco, on being approached, not only neigh and squeal, but prance and leap about in the most ridiculous manner, apparently in defiance, as a challenge. These animals are very easily domesticated, and I have seen some thus kept in Northern Patagonia near a house, though not under any restraint. They are in this state very bold, and readily attack a man by striking him from behind with both knees. The wild guanacos, however, have no idea of defence; even a single dog will secure one of these large animals till the huntsmen can come up. In many of their habits they are like sheep in a flock. Thus, when they see men approaching in several directions on horseback, they soon become bewildered, and know not which way to run. This greatly facilitates the Indian method of hunting, for they are thus easily driven to a central point, and are encompassed."

Photo by J. W. McLellan

GUANACO

The wild original of the llama and alpaca

Guanacos readily take to the water, and have been frequently seen swimming from one island to another. Here again the llamas differ from the camels, for these can swim but little, if at all. Like the Bactrian camel, the guanaco can drink salt water with impunity.

One of the most remarkable traits of the guanaco is that which induces it, when it feels its end to be near, to seek out the dying-place of the tribe, and there breathe out its last. "The guanacos," says Mr. Darwin, "appear to have favourite spots for lying down to die. On the banks of the St. Cruz, in certain circumscribed places, which were generally bushy and all near the river, the ground was actually white with bones. On one such spot I counted between ten and twenty heads. . . . The animals in most cases must have crawled, before dying, beneath and amongst the bushes."

THE LLAMA

This is the first of the two domesticated offshoots of the guanaco, the other being the Alpaca. The LLAMA is a larger beast than the guanaco, and variable in colour. The ancient Peruvians bred it as a beast of burden or for riding, and before the Spanish conquest kept it in enormous numbers. Soon after the Spanish conquest "it was not uncommon to meet droves of from 300 to 500, or even 1,000 llamas, each laden with silver ingots, and the whole in charge of a single native. . . . Only the male llamas were used as beasts of burden, while the smaller females were kept for their milk and flesh. In traveling along the roads, the droves marched in single file, under the guidance of a leader; and such a line would traverse the highest passes of the Cordillera, and skirt the most stupendous precipices with perfect safety. . . . The Spanish conquerors of Peru spoke of llama-flesh as being fully equal to the best mutton, and they established shops in the towns for its regular sale. At the time of the conquest it is estimated that upwards of 300,000 llamas were employed in the transport of the product of the mines of Potosi alone."

THE ALPACA

This animal is bred solely for the sake of its wool, which is of great length and fineness. From it is made the well-known fabric which bears, in consequence, the name "alpaca."

The alpaca is kept in herds on the high grounds of Bolivia and South Peru, whence it is annually driven down to be sheared. The Incas dyed the wool — which is of two qualities, a fine and a coarse — with bright colours, and made it up into cloth or blankets, as the occasion served.

The earliest account of this animal is by Augustin de Zarate, the Treasurer-General of Peru in 1544. He speaks of the beast as a sheep; but since he describes it as camel-like in shape, though devoid of a hump, there can be no doubt that it is the llama he is describing.

LLAMAS

Largely used as beasts of burden in Peru, where these and the alpaca were formerly the only domesticated ruminants

He says: "In places where there is no snow the natives want water, and to supply this they fill the skins of sheep with water, and make other living sheep carry them; for, it must be remarked, these sheep of Peru are large enough to serve as beasts of burden. They can carry about 100 lbs. or more, and the Spaniards used to ride them, and they would go four or five leagues a day. When they are weary, they lie down on the ground; and as there are no means of making them get up, either by beating or assisting them, the load must of necessity be taken off. When there is a man on one of them, if the beast be tired and urged to go on, he turns his head round and discharges his saliva, which has an unpleasant odour, into the rider's face. These animals are of great use and profit to their masters, for their wool is very good and fine . . . and the expense of their food is trifling, as a handful of maize suffices them, and they can go four or five days without water. Their flesh is as good as that of the fat sheep of Castile. There are now public shambles for the sale of their flesh in all parts of Peru, which was not the case when the Spaniards came first."

The particularly offensive habit of spitting in the face of people who may be obnoxious to it is well known to those who are in the habit of seeing much of this animal.

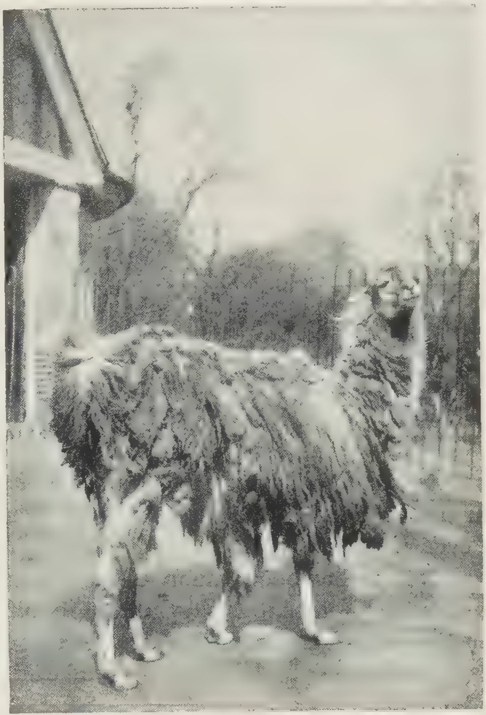
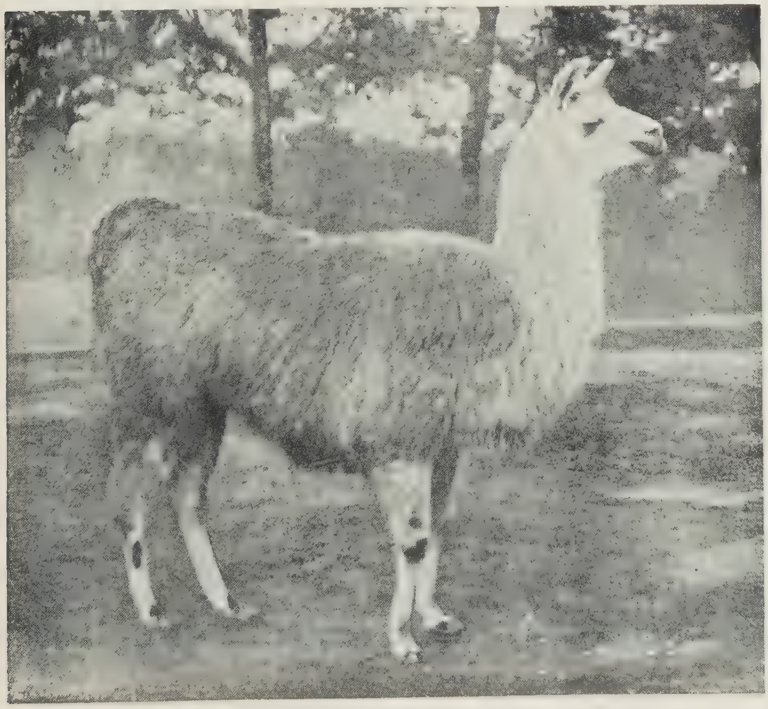


Photo by Miss E. J. Beck

LLAMA

The larger of the two domesticated forms descended from the guanaco



ALPACA

A domesticated form, bred solely for its wool, which is of a dark brown or black colour

THE CHEVROTAINS

MENTION must be made, before passing to the Pig Tribe, of the smallest of hoofed mammals, the Royal Antelope excepted—the CHEVROTAINS. These little animals are hornless, and intermediate in character between the Deer, Camels, and Pigs. The males have large canine teeth, like those of the Musk-deer, with which the Chevrotains have long been confounded. The range of these animals, of which there are five species known, extends from India and Ceylon, through the Malayan countries, as far east as the island of Palawan, in the Philippine group. One species, the largest of the group, occurs on the west coast of Africa.

CHAPTER XIX

THE PIG AND HIPPOPOTAMUS

THE PIG TRIBE

BY H. A. BRYDEN

MANY species and varieties of swine are found in different parts of the world, most of them exhibiting strong traces of a general family resemblance, although widely sundered as to habitats and often markedly differing in outward appearance. All are omnivorous; all have the stomach simpler in type than in the Ruminants; and all have front or incisor teeth in the upper jaw. The two great families of swine proper are the Pigs and Peccaries.

There has been much discussion among scientists as to the early origin of the various breeds of domestic swine found in different parts of the world. There can be little doubt that, although selective breeding has produced extraordinary differences in outward appearance, even among the domestic pigs of our own islands, the origin of the numerous tame races is to be sought in the ancestry of the wild breeds of the countries in which they are found. Darwin has some very apposite remarks on the differences to be observed in domesticated swine. "The peculiar form of the skull and body in the most highly cultivated races is," he observes, "not characteristic of any one race, but is common to all when improved up to

Photo by W. Reid

A DOMESTICATED SOW AND HER PROGENY

The absence of stripes and spots on the young is a feature in which they differ from those of nearly all wild swine

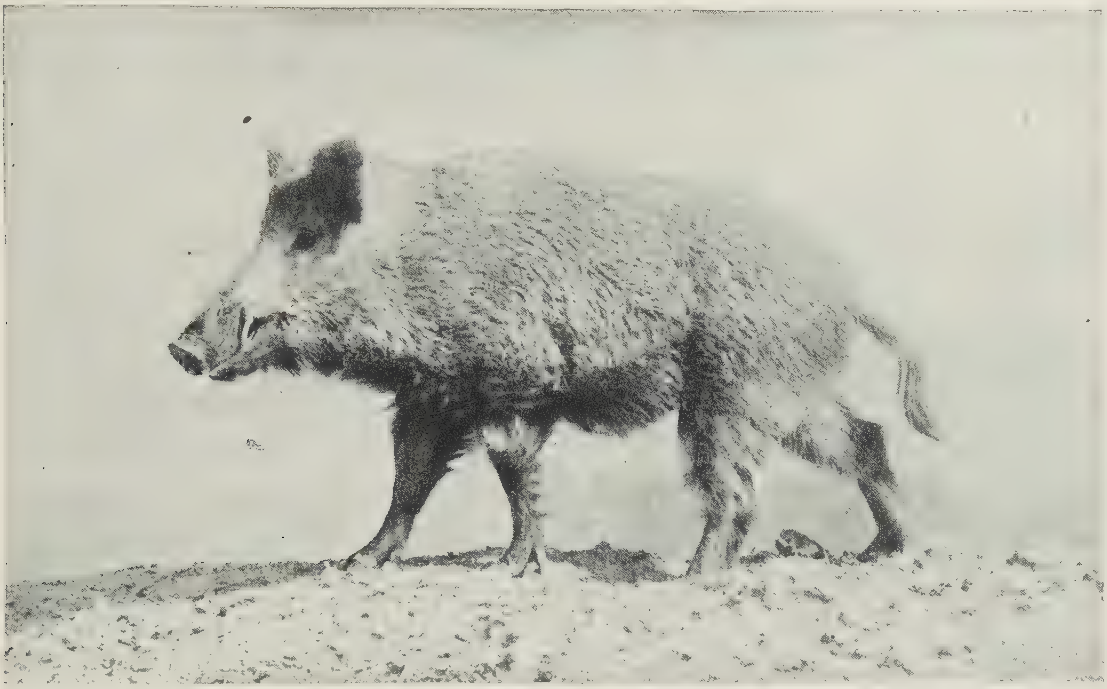


Photo by Ottomar Anschütz] [*Berlin*

WILD BOAR

In its long, bristly hair and powerful lower tusks, the wild boar is a very different animal from its domesticated descendants

the same standard. Thus the large-bodied, long-eared English breed, with a convex back, and the small-bodied, short-eared Chinese breeds, with a concave back, when bred to the same state of perfection, nearly resemble each other in the form of the head and body. This result, it appears, is partly due to similar causes of change acting on the several races, and partly to man breeding the pig for one sole purpose — namely, for the greatest amount of flesh and fat; so that selection has always tended towards one and the same end. With most domestic animals the result of selection has been divergence of character; here it has been convergence."

THE TRUE PIGS

True pigs are found only in the Old World, and even there in very widely different forms. Typical of these quadrupeds is the well-known WILD BOAR, found abundantly in many parts of Europe, North Africa, Asia Minor, and Central Asia. In the British Islands the wild boar must once have been extraordinarily plentiful, especially in Ireland, where its tame descendants still so greatly flourish. In the days of the Plantagenets wild swine fed and sheltered in the woodlands close to London. James I. hunted them near Windsor in 1617, and even down to the year 1683 these animals still had their haunts in the more secluded parts of England. Although now extinct in these Islands, the wild boar is to be found plentifully at the present day in France, Germany, Austria, Russia, and Spain, Greece, Albania, and other countries of the Mediterranean. In most parts of Europe the wild boar is shot during forest drives, but in the Caucasus and round the Black Sea the hardy peasants lie in wait for these animals by the fruit-trees on autumn nights or waylay them going to the water and shoot them single-handed. Many an old Cossack, writes Mr. Clive Phillipps-Wolley, bears the scars of some desperate encounter with these formidable foes. In Spain, where in the old days the boar was pursued by cavaliers with spear and pike, it is still, in the forests of Estremadura, followed with horse and hound, usually, says Mr. Abel Chapman, "during the stillness of a moonlight night, when the acorns are falling from the oaks in the magnificent Estremenian woods."

Photo by J. Turner-Turner, Esq.

DIVING-PIGS

Half-wild pigs, found in Florida, where they live on refuse fish. (*See next page*)

In India the wild boar of Europe and North Africa is replaced by a closely allied species (distinguished by a crest of long black bristles upon the neck and back), which furnishes some of the finest and most exciting sport in the world to mounted hunters armed with a sharp spear. There is not a pluckier or more fearless beast living than the boar; and as he carries long and extremely sharp tusks, and never scruples to use them, he is an exceedingly dangerous opponent when wounded and enraged. Severe and even fatal accidents have happened in the pursuit of this determined beast of chase. When at bay, the boar is absolutely reckless of life; and although pierced and mortally wounded by the spear, will yet force himself up the shaft, and with his dying effort inflict gaping wounds on the horse bearing his attacker. Indian shikaris, to illustrate the courage of the wild boar, say that he has the hardihood to drink at a river between two tigers; and Colonel R. Heber Percy mentions, in the Badminton volumes on "Big Game Shooting," that "several cases are on record in which an old boar has beaten off a tiger, and some in which the latter has been killed by a boar. The boar's extraordinary activity and sharp tusks make him no mean adversary, and his short neck makes it difficult for a tiger to seize it and give it that fatal wrench with which he likes to polish off his victims." A wild boar will stand as much as 3 feet at the shoulder — some sportsmen affirm considerably more — and weigh more than 300 lbs. The finest boar's tusk known is one mentioned in Rowland Ward's "Records of Big Game." This measures 11½ inches over the curve. It came from the Caucasus, and is in the possession of Colonel Veernhof.

It is worthy of note that, while the full-grown individuals of the various species of wild swine are uniformly coloured, their young are longitudinally striped and spotted. In India, besides the common boar, a tiny wild swine, known as the PYGMY HOG, is found in the Bhutan Terai and the forests of Nepal and Sikhim. This pig, which is little bigger than a fox-terrier, runs in considerable troops, or sounders, and is said to attack intruders into its domain much in the same fearless way in which the peccary of America defends its sanctuaries. The height of this diminutive species is given as from 8 to 10 inches — the weight at 10 lbs.

Wild swine are nocturnal in their habits, frequenting moist and marshy country, loving the shade of forests, and making their lairs in tall grass, reed-beds, and similar covert They go far afield for their food-supplies, and do a great deal of damage to crops in cultivated districts. The European wild sow produces from six to ten young, and at least two litters are usually brought forth in the year.

It is remarkable how quickly pigs, as well as other domesticated animals, revert to a semi-feral state of existence, and develop habits suited to a fresh environment. Mr. J. Turner-Turner sends us the following interesting note in connection with this trait: "DIVING-PIGS.—These pigs live in an almost wild condition on certain of the islands off Florida, and subsist chiefly upon the refuse fish cast away by the netsmen. To obtain this, the pigs dive under water, walking on the land at a depth of 5 feet below the surface."

JAVAN WILD PIG

One of several nearly allied species inhabiting the Malay Islands

Among other Asiatic wild swine are to be mentioned the COLLARED PIG, found in Java, Sumatra, and Borneo; the WHITE-WHISKERED JAPANESE PIG; the PAPUAN and FORMOSAN PIGS; the WARTY PIG of Java and Borneo; the CERAM PIG; the CELEBES PIG; and the BEARDED PIG of Borneo, a species distinguished by a quantity of long hair carried upon the cheeks. In the Andaman Islands a small, shaggy wild pig, standing about 20 inches at the shoulder, is found in the forests. Although distinguished from the well-known wild boar of India by certain peculiarities, there is a strong family resemblance to that well-known species in most of these various Asiatic species and races.

Among the many kinds of domesticated swine found in Asia, perhaps the strangest and most curious is the JAPANESE MASKED PIG. This animal is described by Darwin as having "an extraordinary appearance, from its short head, broad forehead and nose, great fleshy ears, and deeply furrowed skin. Not only is the face furrowed, but thick folds of skin, which are harder than the other parts, almost like the plates on the Indian rhinoceros, hang about the shoulders and rump. It is coloured black, with white feet, and breeds true. That it has long been domesticated there can be little doubt; and this might have been inferred even from the circumstance that its young are not longitudinally striped."

In Africa, besides the European wild boar, which there extends its range to Algeria and Morocco, a little known wild pig is the SENAAR BOAR, found in Senaar, Kordofan, and the Soudan region. In the late Dr. Gray's "Catalogue of Carnivora" this wild pig is described as having the fur dense and bristly, and

MALE AND FEMALE BABIRUSA

The chief characteristic of this pig is the peculiar and enormous development of the tusks in the male, the upper pair of which grow through the lips and curve backwards being in colour dull olive-black, varied with yellow. Possibly this little-known swine may prove to be merely a sub-species of the common wild boar of Europe and North Africa. Now that the Soudan regions have once more been opened up to Europeans, we may expect shortly to hear more of this wild swine, as well as of other rare and interesting animals.

WART-HOG

Shows the great size of the head in proportion to the body

Still dealing with the true pigs, we come now to the BUSH-PIGS of Africa and Madagascar. These differ somewhat from the typical wild boars of Europe and India in the structure of the teeth, the long pencilled ear-tufts, the elongated snout, and other characteristics. The tusks are considerably smaller, and seldom exceed 6 or 7 inches in length. The RED RIVER-HOG, or WEST AFRICAN BUSH-PIG, is decidedly the most striking of this group. Smaller than the bush-pig of South Africa, and seldom exceeding 2 feet in height at the shoulder, the colour of this animal is a brilliant reddish brown, with tints of yellow. Noticeable streaks of white are found round the eyes and on the cheeks. The ear-tufts, forehead, and limbs are blackish; more white markings are seen at the tips of the ear-tufts, along the thick mane, and round the margins of the ears. The under-parts are whitish grey in colour. This very handsome pig runs in considerable herds, and is found chiefly in forest and jungle near the banks of the various rivers in West Africa. Its range extends from Angola to Senegambia, and eastwards into the continent as far as Monbuttu.

The well-known BUSH-PIG OF SOUTH AFRICA, the BOSCH-VARK of the Boers, is a fine species, having a wide range over much of the southern and south-eastern parts of the continent. extending as far north as Central Africa. In the Eastern Transvaal and Swaziland these animals attain their greatest size, an adult boar standing from 2 feet 4 inches to 2 feet 7 inches in height, and weighing as much as from 150 to 170 lbs. The usual colour is brownish red, the face and mane greyish; but in different specimens and at different ages great variations are to be noticed. Pale greyish brown or mottled brown are colours often to be found. These bush-pigs are formidable-looking creatures, with thick bristling manes, small deep-set eyes, and sharp if somewhat short tusks, which they know well how to use. Among the old fashioned Boers cured hams from these animals were, when they were more plentiful in Cape Colony, often to be found in up-country farmhouses. The bosch-vark is a beast of shy, nocturnal habit, and, loving as it does the shade and protection of dense covert and bush, is, unless carefully sought for, not often seen by sportsmen. The herds range usually from half a dozen to as many as twenty in number. When once encountered and set up at bay, this wild swine

Photo by Scholastic Photo. Co.

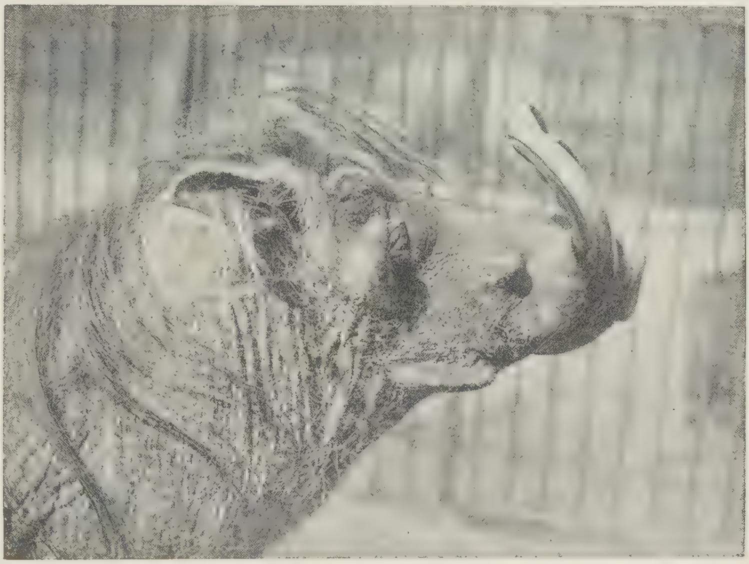
ÆLIAN'S WART-HOG

Displays the broad muzzle and huge tusks, which are nearly as large in the sows as the boars will be found a most tough and courageous adversary, capable and willing to defend itself stoutly against all foes. "They are," says Mr. F. Vaughan Kirby, who has had much experience in hunting these animals, "expert swimmers and swift of foot, and can get over the roughest ground at a great pace. There is no pluckier beast in Africa than a bush-pig, and even a leopard will hesitate before attacking a full-grown boar. Like all wild creatures, they have an instinctive dread of man, and will always make their escape from him if possible; but if surrounded or wounded and brought to bay, they appear to accept the situation with stolid imperturbability, and die fighting with rare pluck, against all odds, grim and silent to the last. . . . Face to face in the middle of a 'fast' bush, and only a Swazi 'stabbing-assegai' with which to kill him, . . . I have seen an old boar, after receiving nine thrusts from those terrible weapons, two of which were still fast in him, make a charge that scattered us like chaff, and in three consecutive lunges lame one of our number for life, and disembowel two of the finest 'pig-dogs' I ever hunted with. In such encounters a boar inflicts terrible wounds with his teeth, as well as with his tusks." Few men care to face a wart-hog on foot

Another bush-pig is found in Madagascar, and is known as EDWARDS' BUSH-PIG. Its habits are very similar to those of its brethren in the neighbouring continent of Africa.

THE BABIRUSA

Quitting the true pigs, we come now to perhaps the very strangest and most singular of all the great tribe of swine. This is the BABIRUSA, that curious and grotesque creature found in the island of Celebes, in the Malay Archipelago. The name Babirusa signifies "pig-deer." It is of course a misnomer, and the animal has no kinship whatever with the cervine race. The babirusa is a wild swine, having a dark slate-grey skin, very sparsely covered with hair along the ridge of the spine. This skin is very extraordinarily wrinkled. The ears are much smaller than is the case with other members of the swine group, while the tail is short, straight, and lacks any semblance of tuft. The females have small tusks. In the boars the tusks are most singularly and abnormally developed. From the upper jaw, instead of curving from the side of the lips, the tusks grow from the centre of the muzzle, penetrate right through the skin, and curve backwards often till they touch the forehead. The lower tusks have also a strong curve, but are not so long as those of the upper jaw Although thus superabundantly provided with tushes, the babirusa is, as regards the rest of its teeth, less well off, having only thirty-four, as against the forty-four of the European wild boar. In their habits these singular pigs much resemble other wild swine, going in herds and frequenting forest, jungle, and the banks of rivers. They are excellent swimmers. The young are, unlike other wild swine in the infant state, unstriped. These animals are often found domesticated about the dwellings of native chiefs in Celebes. The weight of a good male is as much as 128 lbs.; height at shoulder, 27½ inches. The longest tusk recorded measures 17 inches



HEAD OF MALE WART-HOG

Profile showing the large conical warty growths on the side of the face so characteristic of these animals over the curve. These animals are driven into nets and speared by the natives of Celebes, and afford excellent sport, the boars especially charging viciously at their assailants

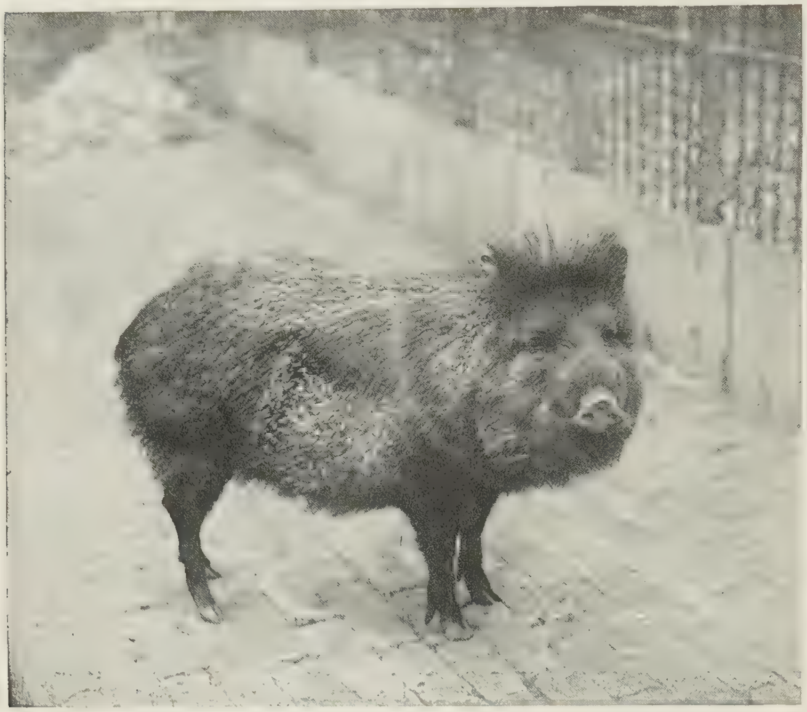


Photo by W. P. Dando

COLLARED PECCARY

Peccaries are the American representatives of the Swine, and are characterised by a large gland on the back

The Wart-hogs

If the babirusa of the Malay Archipelago is a sufficiently bizarre-looking creature, the wart-hog of Africa yields to none of the wild pigs in sheer, downright hideousness of aspect. The Wart-hog of South Africa, the Vlakte-vark (Pig of the Plains) of the Boers, has long been familiar to hunters and naturalists. Standing some 30 inches in height, this wild swine is distinguished by the disproportionate size of the head, extreme length, breadth, and flatness of the front of the face and muzzle, smallish ears, huge tusks, and the strange wart-like protuberances from which it takes its name. Three of these wen-like growths are found on each side of the face. The tusks of the upper jaw, unlike the teeth of the true pigs, are much larger than those protruding from the lower jaw. The lower tusks seldom exceed 6 inches in length; those of the upper jaw occasionally reach as much as 20 inches over the curve. A pair from North-east Africa (Annesley Bay, on the Abyssinian littoral) measure respectively 27 and 26 inches — truly gigantic trophies. The skin of this wild hog is nearly naked, except upon the neck and back, where a long, coarse mane of dark bristly hair is to be observed. Wart-hogs, as their Dutch name implies, in the days when game was plentiful, were often found in open country, on the broad grass-plains and karroos. At the present day they are less often seen in the open. They run in small family parties, usually two or three sows and their litters. The old boars, throughout a great part of the year, prefer a more solitary existence. These animals, when pursued, usually betake themselves to an open earth, not of their own making, and, slewing round sharply just as they enter, make their way in hind end first. They afford no great sport to the hunter, and are usually secured with a rifle-bullet. The flesh is fairly good eating, especially that of a young and tender specimen. Speaking generally, wart-hogs are nothing like such fierce and determined opponents as the wild boars of Europe and India, or even the bush-pig. They will, however, charge occasionally, and have been known to attack and rip up a horse. A northern species — Ælian's Wart-hog — is found in Abyssinia, Somaliland, and other parts of East Africa, where — especially in Abyssinia — it roams the mountains and their vicinity, occasionally to a height of 9,000 or 10,000 feet. There is little difference between this and the southern form. Wart-hogs produce usually three or four young, and the sow makes her litter in a disused burrow. Unlike those of the majority of wild swine, the young of the wart-hog are uniformly coloured, having no white stripes or spots.

THE PECCARIES

Peculiar to the American Continent, the PECCARIES differ considerably from the wild swine of the Old World. They are of small size; the dentition is not the same, the stomach is more complicated in structure, and the hind feet have three instead of four toes. In general appearance peccaries are not unlike small dark-coloured pigs, well covered with bristles, and having, as well as a prominent mane, a deep fringe of hair beneath the throat. They are essentially forest-loving animals, roaming over large tracts of country and making considerable migrations in search of food. Two species have been distinctly identified by naturalists — the COLLARED PECCARY, and the WHITE-LIPPED PECCARY. Of these, the former species is found from Texas, in North America, as far south as the Rio Negro, in Patagonia. The habitat of the white-lipped peccary is more circumscribed, and the animal is seldom found except in that part of South and Central America lying between British Honduras and Paraguay. No members of the Pig Family are fiercer or more tenacious of their sanctuaries than the white-lipped peccary, which roams the dense forests of Brazil and Paraguay in large herds. A human being, attacked and surrounded by a herd of these savage little creatures, would indeed stand but a poor chance of his life, and many a hunter and traveler has been compelled to seek refuge in a tree and sustain some hours of siege. Of the two species, the white-lipped peccary is somewhat the larger, standing from 15 to 17½ inches in height. The collared peccary averages from 13½ to 15½ inches. The flesh of these wild swine is not in much repute, and unless the back-gland is at once cut out a freshly killed specimen will become quickly spoiled as a human food-supply. Young peccaries appear to be easily tamed, fierce as is their nature in the wild state. In contrast with the abundant litters of other pigs, wild and domesticated, only one offspring is ordinarily produced at birth. In fighting, the peccary does not rip like the wild boar, but inflicts savage and severe bites.

"Untrained dogs," says President Roosevelt, "even those of a large size, will speedily be killed by a single peccary, and if they venture to attack a herd will be literally torn into shreds. A big trained dog, however, can, single-handed, kill a peccary, and I have known the feat performed several times."

Azara, the eminent Spanish naturalist of the end of the eighteenth century, had considerable experience of the peccaries of Central and Southern America, where the Indians are much addicted to taming wild animals, and keep both the peccary and the tapir in a state of semi-domestication. The peccary he found to be domesticated more easily than might be expected. Though so fierce in its wild state, it soon becomes troublesome from its familiarity.

Mr. Schomburgk, the explorer of Central America, whose travels were so constantly quoted during the Venezuelan arbitration, saw much of the white-lipped species in the forests. He found the animals in large troops under the leadership of an old boar. When attacked, they were ready to surround man, dog, or jaguar; and if there were no means of escape, the enemy was certain to be cut to pieces. He himself had a narrow escape from an infuriated herd, the leader of which he shot in the act of rushing at him. As the herd approached the sound was like that of a whirlwind through the bushes.

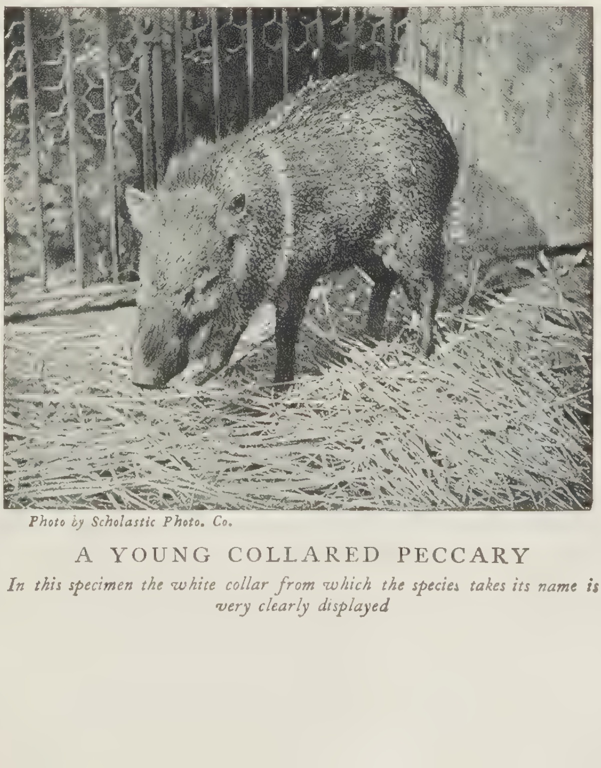


Photo by Scholastic Photo. Co.

A YOUNG COLLARED PECCARY

In this specimen the white collar from which the species takes its name is very clearly displayed

By permission of Herr Carl Hagenbeck, Hamburg

A THREE-YEAR-OLD HIPPOPOTAMUS

In this specimen the great lower tusks are not yet developed

THE HIPPOPOTAMUS

BY F. C. SELOUS

Two species of the Hippopotamus Family exist on the earth to-day, both of which are inhabitants of Africa, and are not found in any other country; but the remains of many extinct forms of this genus which have been discovered in various parts of Europe and Asia show that in Pleistocene and Pliocene times these strange and uncouth animals must have been widely distributed throughout the greater part of the Old World. The fossil remains of the large form of hippopotamus which once frequented the lakes and rivers of England and Western Europe cannot be distinguished from the bones of the common African species of to-day, which latter is possibly the only animal in the world which has undergone no change in form or structure since the prehistoric savages of the Thames Valley threw stone-headed spears at their enemies.

The COMMON HIPPOPOTAMUS, though it has long been banished from the Lower Nile, and has more recently been practically exterminated in the British colonies south of the Limpopo, was once an inhabitant of every lake and river throughout the entire African Continent from the delta of the Nile to the neighbourhood of Cape Town. Now it is not found below Khartum, on the Nile; but in Southern Africa a few hippopotamuses are said still to exist in the lower reaches of the Orange River. When Van Riebeck first landed at the Cape, in 1652, he found some of these animals in the swamp now occupied by Church Square, in the centre of Cape Town, and the last in the district was only killed in the Berg River, about seventy miles north of that city, as recently as 1874. This animal, which had been protected for some years, was at last shot, as it had become very savage, and was in the habit of attacking any one who approached it. In my own experience I have met with the hippopotamus in all the large rivers of Africa where I have travelled, such as the Zambesi, Kafukwe, Chobi, Sabi, Limpopo, and Usutu, and also in most of the many large streams which take their rise on the plateau of Matabililand and Mashonaland, and flow north, south, and east into the Zambesi, the Limpopo, or the Sabi. I have also seen them in the sea, at the mouth of the Quillimani River, and have heard from natives that they will travel by sea from the mouth of one river to another.

Hippopotamuses live either in families of a few individuals or in herds that may number from twenty to thirty members. Old bulls are often met with alone, and cows when about to calve will sometimes leave their companions and live for a time in seclusion, returning, however, to the herd soon after the birth of their calves. Although, owing to the shortness of its legs, a hippopotamus bull does not stand very high at the shoulder — about 4 feet 8 inches being the average height — yet its body is of enormous bulk. A male which died some years ago in the Zoological Gardens of London measured 12 feet in length from the nose to the root of the tail, and weighed 4 tons; and these dimensions are probably often exceeded in a wild state.

The huge mouth of the hippopotamus (see Coloured Plate), which the animal is fond of opening to its widest extent, is furnished with very large canine and incisor teeth, which are kept sharp by constantly grinding one against another, and thus enable their possessor

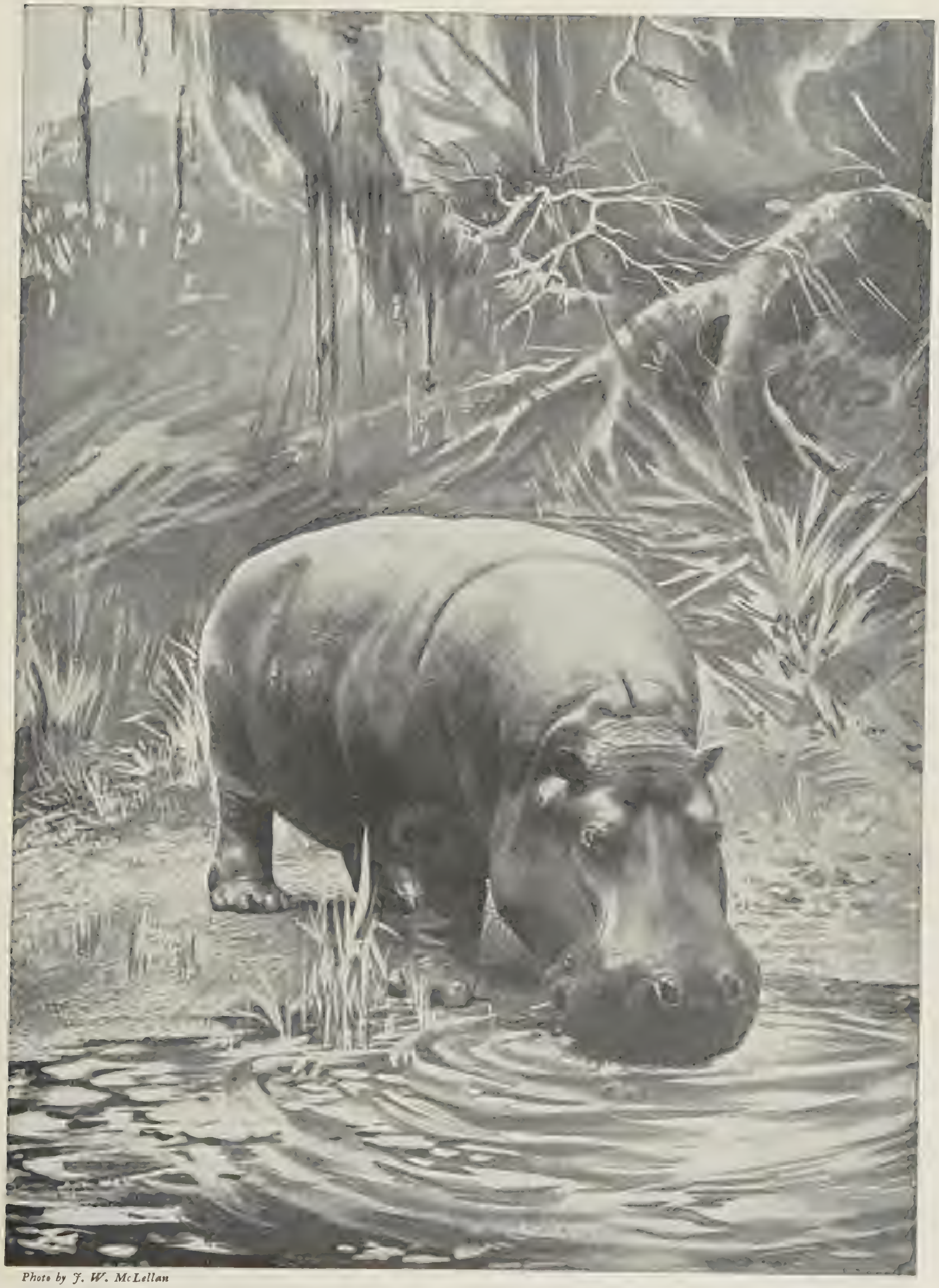


Photo by J. W. McLellan

HIPPOPOTAMUS DRINKING

The enormous breadth of the muzzle, as well as the small nostrils, which can be closed at will, are clearly displayed in this posture to rapidly cut down great quantities of the coarse grass and reeds upon which these animals exclusively feed when living in uninhabited countries. When, however, their haunts are in the neighbourhood of native villages, they often commit great havoc in the corn-fields of the inhabitants, trampling down as much as they eat; and it was their fondness for sugar cane which brought about the destruction of the last herd of hippopotamuses surviving in Natal.

The lower canine teeth or tusks of the hippopotamus grow to a great size, and in bulls may weigh from 4 lbs. to 7 lbs. each. They are curved in shape, and when extracted from the jaw form a complete half-circle, and have been known to measure upwards of 30 inches over the curve. In life, however, not more than a third of their length protrudes beyond the gums.

During the daytime hippopotamuses are seldom met with out of the water. They lie and doze all day long in the deep pools of the rivers they frequent, with only their eyes, ears, and nostrils above the surface, or else bask in the sun on the tail of a sandbank, looking like so many gigantic pigs with their bodies only partially submerged. Sometimes they will lie and sleep entirely out of water amongst reeds. I have seen them feeding in the reed-beds of the great swamps of the Chobi just at sundown, but as a rule they do not leave the water until after dark. At night they often wander far afield, especially in the rainy season, in search of suitable food; and after having been fired at and frightened, I have known a herd of hippopotamuses to travel at least five-and-twenty miles along the course of a river during the ensuing night, in order to reach a larger and deeper pool than the one in which they had been molested.

HIPPOPOTAMUSES BATHING

A hippopotamus stays under water for about 2½ minutes at a time, and then just shows part of its head above water while it draws a fresh breath

Although the hippopotamus is thoroughly at home in the hottest parts of Africa, and appears to thrive in the tepid waters of all the rivers which flow through the malarious coast regions of the tropical portions of that continent, it is also found at a considerable altitude above the sea, and in quite small streams where the temperature of the water during the winter months cannot be many degrees above freezing-point. I have personally met with hippopotamuses in the Manyami River, not far from the present town of Salisbury, in Mashonaland. The country there has an altitude of about 5,000 feet above sea-level; and the water was so cold on the last occasion on which I came across the animals in question — July, 1887 — that, if a basinful was left out during the night, ice quite an eighth of an inch in thickness would be formed over it before morning. There was, however, never any ice on the river itself. During the rainy season, when the grass and reeds are green and succulent, hippopotamuses become enormously fat, especially in the higher and colder portions of their range, and retain a good deal of their fat right through the driest season of the year. Old bulls are usually very lean; but I have seen cows the greater part of whose carcasses, after the skin had been stripped off, was covered with a layer of fat from 1 inch to 2 inches in thickness. The meat of these animals is dark red in colour, and more like beef than pork. To my mind, that of a young animal is most excellent in flavour, and far preferable to that of a lean antelope. The fat, when prepared, is as good as the best lard, from which, indeed, it is hardly distinguishable. The skin of the

By permission of Herr Carl Hagenbeck] [*Hamburg*

BABY HIPPOPOTAMUS, AGED SIX MONTHS

The flesh of a young hippopotamus is said to have an excellent flavour. Natives often follow shooting expeditions in order to secure some of its meat

hippopotamus is smooth and hairless, and in adult animals quite 1½ inch in thickness on the upper parts of the body.

Hippopotamuses are said to be capable of remaining under water for ten or twelve minutes. Should, however, a herd of these animals be watched but not fired at from the bank of a river in which they are passing the day, they will all sink below the surface of the water as soon as they become aware of and more or less alarmed by the presence of the intruder, but each member of the herd will come up to breathe at intervals of from one to two minutes. I have seen hippopotamuses so tame and unsuspicious of danger that they allowed me — the first human being probably with any kind of hat or clothes on him that they had ever seen — to take up a position within fifty yards of them on the edge of the deep rock-bound pool in which they were resting without showing any signs of alarm. They simply stared at me in an inquisitive sort of way, raising their heads higher out of the water, and constantly twitching their little rounded ears; and it was not until a number of natives came up and began to talk loudly that they took alarm, and, sinking out of sight, retreated to the farther end of the pool. I once took the length of time with my watch for more than an hour that a hippopotamus which I was trying to shoot remained under water. This animal, a cow with a new-born calf, had made an attack upon one of my canoes. It first came up under the canoe, tilting one end of it into the air and almost filling it with water. Then it made a rush at the half-swamped craft, and, laying its huge head over it, pressed it down under the water and sank it. There were four natives in the canoe at the time of the attack, all of whom swam safely to an island in the river — the Zambesi. After the accident — which caused me a good deal of loss and inconvenience — I tried to shoot this unprovoked aggressor, but unsuccessfully, as the river was too broad to allow me to get anything but a long shot at her. The shortest time she remained under water during the seventy minutes I was paying attention to her was forty seconds, and the longest four minutes and twenty seconds — the usual time being from two to two and a half minutes. She always remained a long time under water after having been fired at.

The capsizing of canoes by these animals is quite a common occurrence on most African rivers, and the great pains the natives will take in certain districts to give these animals a wide berth seem to prove that they have good reason to dread them. Solitary bulls and cows with young calves are the most feared. Such animals will sometimes, I have been assured by the natives, tear out the side of a canoe with their teeth, and even crunch up some of its occupants whilst they are trying to save themselves by swimming. Sipopo, a chief of the Barotse tribe, who was deposed by his nephew Mona Wena in 1876, was said to have been attacked and killed by a hippopotamus whilst lying wounded amongst the reeds on the southern bank of the Zambesi, but I cannot vouch for the truth of the story.

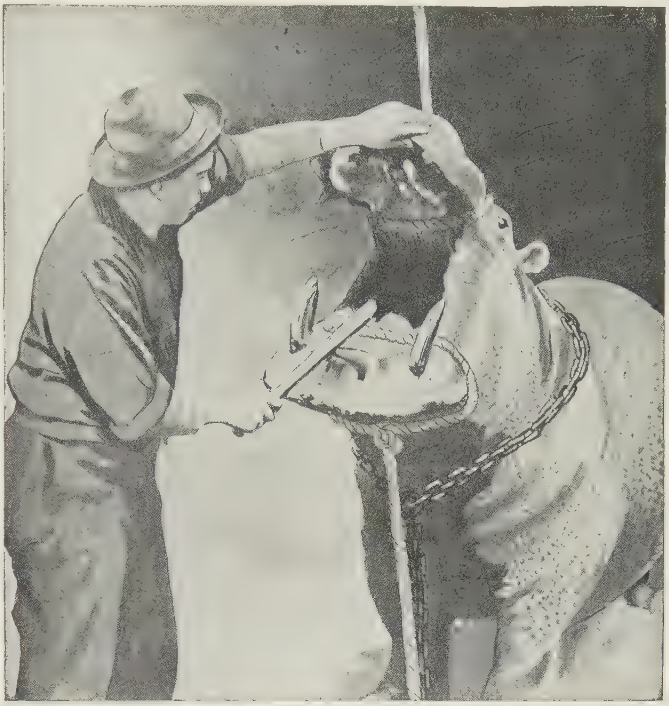
Bull hippopotamuses must be rather quarrelsome, as I have shot several whose hides were deeply scored with wounds, no doubt inflicted by the tusks of their rivals. Once I killed a hippopotamus in a shallow lagoon amongst the swamps of the Chobi, whose enormously thick hide had been literally cut to pieces from head to tail. The entire body of this animal was covered with deep white scores, and we were unable to cut a single sjambok from its skin. We found, on examination, that this poor beast had been wounded by natives, and then in its distress most cruelly set upon by its fellows, and finally expelled from their society. It was in the last stage of emaciation, and a bullet through the brain must have been a welcome relief. On another occasion a hippopotamus bull, which I had wounded in the nose, became so furious that it dived down and attacked one of its fellows which had already been killed and was lying dead at the bottom of the pool. Seizing this latter animal by the hind leg, it brought it to the surface of the water with such a furious rush that not only half the body of the dead animal it had attacked was exposed, but the whole of its own head and shoulders came above the water. A bullet through the brain killed it instantly, and it sank to the bottom of the pool, still holding its companion's hind leg fast in its jaws.

NO. I

DENTAL OPERATIONS ON A HIPPOPOTAMUS

This and the next two photographs probably constitute the most remarkable series of animal photographs ever seen. No. 1 shows a hippopotamus about to be trapped, preparatory to having its teeth attended to

When a hippopotamus is killed in the water, the carcase sinks to the bottom, and in the cold water of the rivers of Mashonaland will not rise to the surface till six hours after death. In the warmer water of the Lower Zambesi a dead hippopotamus will come up in about half that time. When it rises, the carcase comes up like a submerged cork, with a rush as it were, and then settles down, only a small piece of the side showing above the surface. As decomposition sets in, it becomes more and more swollen, and shows higher and higher above the water. When the body of a dead hippopotamus has been taken by the wind or current to the wrong side of a river, I have often climbed on to it and paddled it with a stout stick right across the river to a spot nearer camp. A dead hippopotamus is not the easiest or the pleasantest thing to sit on in deep water with crocodiles about, especially in a wind, as it is very much like sitting on a floating barrel, and unless the balance is exactly maintained one is bound to roll off.

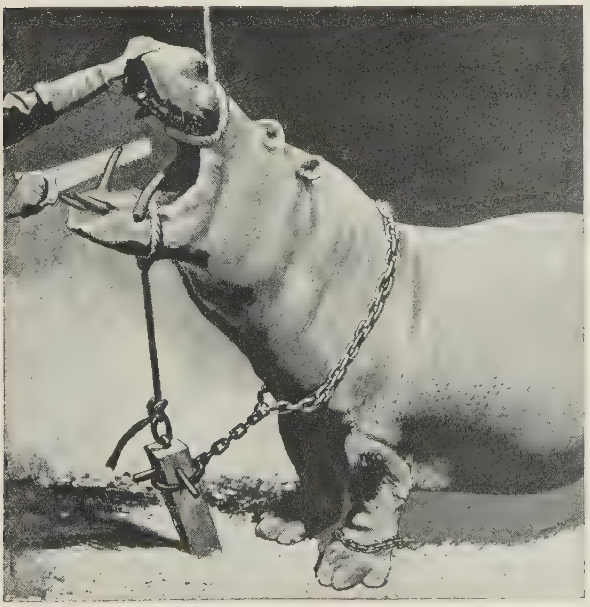


NO. II

DENTAL OPERATIONS ON A HIPPOPOTAMUS

This shows the process of filing one of the lower tusks

Although it is often necessary for an African traveler to shoot one or more of them in order to obtain a supply of meat for his native followers, there is not much sport attached to the killing of these animals. The modern small-bore rifles, with their low trajectory and great penetration, render their destruction very easy when they are encountered in small lakes or narrow rivers, though in larger sheets of water, where they must be approached and shot from rickety canoes, it is by no means a simple matter to kill hippopotamuses, especially after they have grown shy and wary through persecution. As these animals are almost invariably killed by Europeans in the daytime, and are therefore encountered in the water, they are usually shot through the brain as they raise their heads above the surface to breathe. By the natives hippopotamuses are killed in various ways. They are sometimes attacked first with harpoons, to which long lines are attached, with a float at the end to mark the position of the wounded animal, and then followed up in canoes and finally speared to death. Sometimes they are caught in huge pitfalls, or killed by the fall of a spear-head fixed in a heavy block of wood, which is released from its position when a line, attached to the weight and then pegged across a hippopotamus's path a few inches above the ground, is suddenly pulled by the feet of one of these animals striking against it. A friend of mine once had a horse killed under him by a similar trap set for buffaloes. His horse's feet struck the line attached to the heavily weighted spear-head, and down it came, just missing his head and entering his horse's back close behind the saddle. Where the natives have guns — mostly old muzzle-loading weapons of large bore — they often shoot hippopotamuses at close quarters when they are feeding at night. The most destructive native method, however, of killing these monsters with which I am acquainted is one which used to be practised by the natives of Northern Mashonaland—namely, fencing in



NO. III

DENTAL OPERATIONS ON A HIPPOPOTAMUS

Sawing off one of the lower tusks

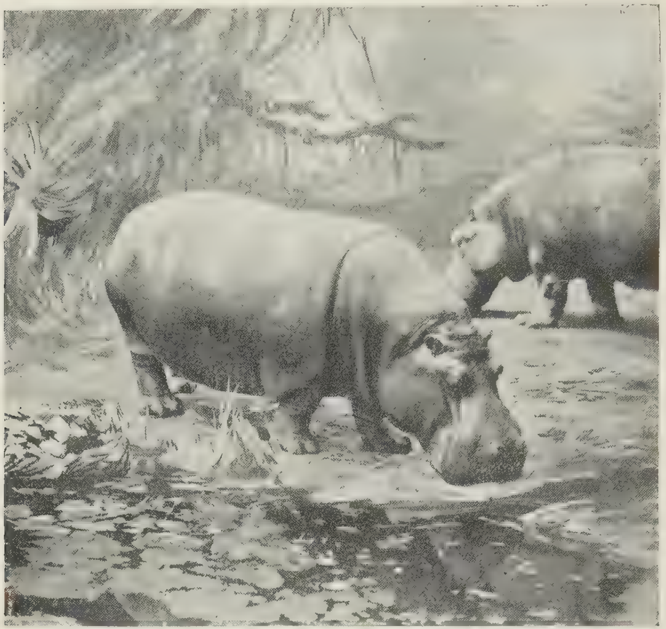


Photo by York & Son] [*Notting Hill*

FEMALE HIPPOPOTAMUSES

Exhibits a very characteristic attitude of the animal

a herd of these animals and starving them to death. As there is a very rapid fall in the country through which all the rivers run to the Zambesi from the northern slope of Mashonaland, these streams consist of a series of deep, still pools (called "sea-cow holes" by the old hunters), from a hundred yards to more than a mile in length, connected with one another by shallow, swift-flowing water, often running in several small streams over the bed of the river. A herd of hippopotamuses having been found resting for the day in one of the smaller pools, all the natives in the district, men, women, and children, would collect and build strong fences across the shallows at each end. At night large fires would be kept blazing all round the pool and tom-toms beaten incessantly, in order to prevent the imprisoned animals from escaping. Day after day the fences would be strengthened, and platforms sometimes built to command naturally weak places, and from these points of vantage the poor animals were speared when in their desperation they tried to leave the pool. Gradually the whole herd would be speared or starved to death.

Once, in August, 1880, I came upon a native tribe engaged in starving to death a herd of hippopotamuses in a pool of the Umniati River, in Northern Mashonaland. When I came on the scene, there were ten hippopotamuses still alive in the pool. Eight of these appeared to be standing on a sandbank in the middle of the river, as more than half their bodies were above the water. They were all huddled up together, their heads resting on each other's bodies. Two others were swimming about, each with a heavily shafted assegai sticking in its back. Besides these ten still living hippopotamuses two dead ones were being cut up on the side of the pool, and many more must already have been

Photo by York & Son] [*Notting Hill*

A HIPPOPOTAMUS FAMILY—FATHER, MOTHER, AND YOUNG

Hippopotamuses are very sociable animals, and are often to be met with in large herds

Photo by G. W. Wilson & Co., Ltd.

HIPPOPOTAMUS

The skin of the hippopotamus is often as much as an inch and a half in thickness on the upper parts of the body

killed, as all round the pool festoons of meat were hanging on poles to dry, and a large number of natives had been living for some time on nothing but hippopotamus-meat. Altogether I imagine that a herd of at least twenty animals must have been destroyed. Much as one must regret such a wholesale slaughter, it must be remembered that this great killing was the work of hungry savages, who at any rate utilised every scrap of the meat thus obtained, and much of the skin as well, for food; and such an incident is far less reprehensible — indeed, stands on quite a different plane as regards moral guilt — to the wanton destruction of a large number of hippopotamuses in the Umzingwani River, near Bulawayo, within a few months of the conquest of Matabililand by the Chartered Company's forces in 1893 These animals had been protected for many years by Lo Bengula and his father Umziligazi before him; but no sooner were the Matabili conquered and their country thrown open to white men than certain unscrupulous persons destroyed all but a very few of these half-tame animals, for the sake of the few paltry pieces of money their hides were worth!

Gradually, as the world grows older, more civilised, and, to my thinking, less and less interesting, the range of the hippopotamus, like that of all other large animals, must become more and more circumscribed; but now that all Africa has been parcelled out amongst the white races of Western Europe, if the indiscriminate killing of hippopotamuses by either white men or natives can be controlled, and the constant and cruel custom of firing at the heads of these animals from the decks of river-steamers all over Africa be put a stop to, I believe that this most interesting mammal, owing to the nature of its habitat, and the vast extent of the rivers, swamps, and lakes in which it still exists in considerable numbers, will long outlive all other pachydermatous animals. Hideous, uncouth, and unnecessary as the hippopotamus

Photo by York & Son] [Notting Hill

MALE AND FEMALE HIPPOPOTAMUSES

A hippopotamus is almost inseparable from the water; it never goes farther away than possible from a river or lake

may seem when viewed from behind the bars of its den in a zoological garden, it is nevertheless true that, when these animals have been banished from an African river by the progress of civilisation, that river has lost one of its highest charms and greatest ornaments.

The PYGMY or LIBERIAN HIPPOPOTAMUS is confined to Upper Guinea, and, compared with its only existing relative, is a very small animal, not standing more than 2 feet 6 inches in height, and measuring less than 6 feet in length. In weight a full-grown specimen will scale about 400 lbs. But little is known of the habits of this rare animal, specimens of which, I believe, have never been obtained, except by the German naturalists Herrn Büttikofer and Jentink. When alive, the colour of the skin of the pygmy hippopotamus is said to be of a greenish black, changing on the under-parts to yellowish green. The surface of the skin is very shiny. This species, unlike its giant relative, does not congregate in herds, nor pass its days in rivers or lakes, but lives in pairs in marshes or shady forests. It sleeps during the day, and at night wanders over a great extent of country, eating grass, wild fruits, and the young shoots of trees. Its flesh is said to be very succulent and much esteemed by the natives.

A hippopotamus, apparently of the same species as that now found in Africa, formerly inhabited the Thames Valley. Great quantities of fossil remains of another species are also found in the island of Sicily. The bones found in England are mainly in the river gravel and brick earth of the south and midland districts of England. This seems to show that at the time when the animal existed our rivers must have been open all the year, and not ice-bound, for it is certain that no hippopotamus could live in a river which froze in winter. Yet among the remains of these animals are also found those of quite arctic species like the Musk-ox and the Reindeer, together with those of the Saiga Antelope, an inhabitant of the cold plateau of Tibet. The problem is: How could these creatures, one a dweller in warm rivers and the others inhabitants of cold arctic or sub-arctic regions, have existed together, apparently on the same area of ground? The answer, which does not seem to have occurred to naturalists who have discussed the question, seems to be plain enough. Any one who knows the conditions of the great rift valleys of Central Africa has the key to the solution of the puzzle. There was probably a very great difference in the vertical plane. Deep in the rift was probably a warm river, while above it may have been mountains from 10,000 to 20,000 feet high, with snow on the summits and glaciers in their valleys. On these cold and arctic heights the reindeer and the musk-ox would find congenial homes. Thousands of feet below, in the hot and narrow valley, the hippopotamus would revel in a warm and steamy climate. This is what actually occurs in the rift valleys of Central Africa, where the hippopotamus swims in rivers that are at no great distance from snow-covered and ice-capped mountains.

CHAPTER XX

THE DUGONG, MANATEES, WHALES, PORPOISES, AND DOLPHINS

BY F. G. AFLALO, F. Z. S.

THE DUGONG AND MANATEES

THESE curious creatures, which seem to have been the basis of much of the old mermaid legend, have puzzled many eminent naturalists. Before they were placed in an order by themselves, Linnæus had classed them with the Walrus, Cuvier with the Whales, and another French zoologist with the Elephants. They are popularly regarded as the cows of the sea-pastures. Their habits justify this. I have often watched dugongs on the Queensland coast browsing on the long grasses, of which they tear up tussocks with sidelong twists of the head, coming to the surface to breathe at short intervals.

Omitting the extinct Rhytina, otherwise known as Steller's Sea-cow, which was exterminated in the Bering Strait not very long after civilised man had first learnt of its existence, we have to consider two distinct groups, or genera, of these sirenians. The DUGONG is the representative of the first, and the two MANATEES belong to the other.

The dugong is found on the coasts of Northern Australia, in many parts of the Indian Ocean (particularly off Ceylon), and in the Red Sea. It is easily distinguished, by even superficial observation, from the manatees. Its tail is slightly forked, somewhat like that of the whales: the tail of manatees, on the other hand, is rounded. The dugong's flippers, to which we also find a superficial resemblance in those of the whale, show no traces of external nails: in those of the manatees, which show projecting nails, there is a considerable power of free movement (the hands being, in fact, used in manipulating the food), which is not the

Photo by A. S. Rudland & Sons

DUGONG

A vegetable-feeding sea-mammal from the Indian Ocean and North Australian waters

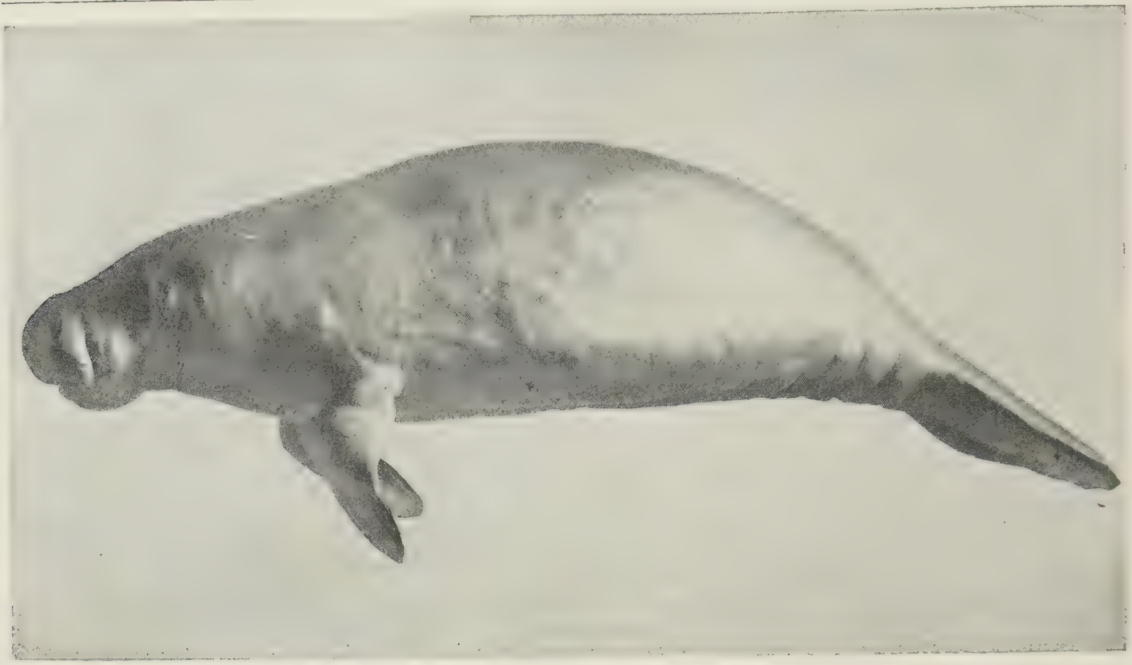


Photo by A. S. Rudland & Sons

AMERICAN MANATEE

Found in the Amazons River. The Manatees differ remarkably from the Dugong in the number and structure of their teeth

case in the limbs of the whale. The body of the dugong is almost smooth, though there are bristles in the region of the mouth: that of the manatees is studded with short hairs. The male dugong has two large tusks: in neither sex of the manatees are such tusks developed. Finally, a more detailed examination of the skeletons would reveal the fact that, whereas the dugong has the usual seven bones in the neck, that of the manatees has only six.

When we come to the Whales, we shall encounter that very characteristic covering known as "blubber"; and, though it is present in smaller quantity, these sirenians have blubber as well. Complex stomachs they also have, like the whales, only in their case both the nature of the food and the structure of the teeth point clearly to a ruminating habit, which, for reasons that will be given in the right place, seems inadmissible in the whales. In both dugong and manatees the mouth is furnished with singular horny plates, the precise use of which does not appear to have been satisfactorily determined; and the upper lip of the manatee is cleft in two hairy pads that work laterally. This enables the animal to draw the grass into its mouth without using the lower lip at all.

In their mode of life the dugong and manatees differ as widely almost as in their appearance; for the former is a creature of open coasts, whereas the manatees hug river-estuaries and even travel many miles up the rivers. Of both it has been said that they leave the water at night, and the manatees have even been accused of plundering crops near the banks. The few, however, which have been under observation in captivity have always been manifestly uncomfortable whenever, by accident or otherwise, the water of their tank was run off, so that there is not sufficient reason for believing this assertion.

This group of animals cannot be regarded as possessing any high commercial value, though both natives and white men eat their flesh, and the afore-mentioned rhytina was, in fact, exterminated solely for the sake of its meat. There is also a limited use for the bones as ivory, and the leather is employed on a small scale, — a German writer has, in fact, been at great pains to prove that the Tabernacle, which was 300 cubits long, was roofed with dugong-skin, and the Red Sea is certainly well within the animal's range.

The Whales, Porpoises, and Dolphins

Although anatomists have good reason for suspecting that all the members of the Whale Tribe are directly descended from river-dwelling forms, if not indeed, more remotely, from some land animal, there is something appropriate in the fact of the vast ocean, which covers something like three-quarters of the earth's surface, producing the mightiest creatures which have ever lived. There should also be some little satisfaction for ourselves in the thought that, their fish-like form notwithstanding, these enormous beings really belong to the highest, or mammalian, class of animal life.

One striking feature all these many-sized cetaceans have in common, and that is their similarity of form. Though they may vary in length from 70 to 7 feet, their outline shows a remarkable uniformity. Important internal and even external differences there may be. A whale may be toothed or toothless; a dolphin may be beaked or round-headed; either may be with or without a slight ridge on the back or a distinct dorsal fin; but no cetacean could well be mistaken for an animal of any other order. It is as well to appreciate as clearly as possible this close general resemblance between the largest whale and the smallest dolphin, as the similarity is one of some interest; and we may estimate it at its proper worth if we bear in mind that two species of cetaceans, outwardly alike, may not, perhaps, be more closely allied than such divergent ruminant types as the elephant, the giraffe, and the gazelle.

Reference has already been made to the fact that the whales are true mammals, and we must now clearly set before us the justification for separating them from the Fishes — to which any one with a superficial knowledge of their habits and appearance would unhesitatingly assign them — and raising them to the company of other mammals. Let us first separate them from the Fishes. The vast majority of fishes, with some familiar exceptions like the conger-eel, are covered with scales: whales have no scales. The tail of fishes, often forked like that of whales, is set vertically: in whales the tail is set laterally, and for this a good reason will presently be shown. Fishes have anal fins: whales not only have no anal fins, but their so-called pectoral fins differ radically from the fins of fishes. Fishes breathe with the aid of gills: whales have

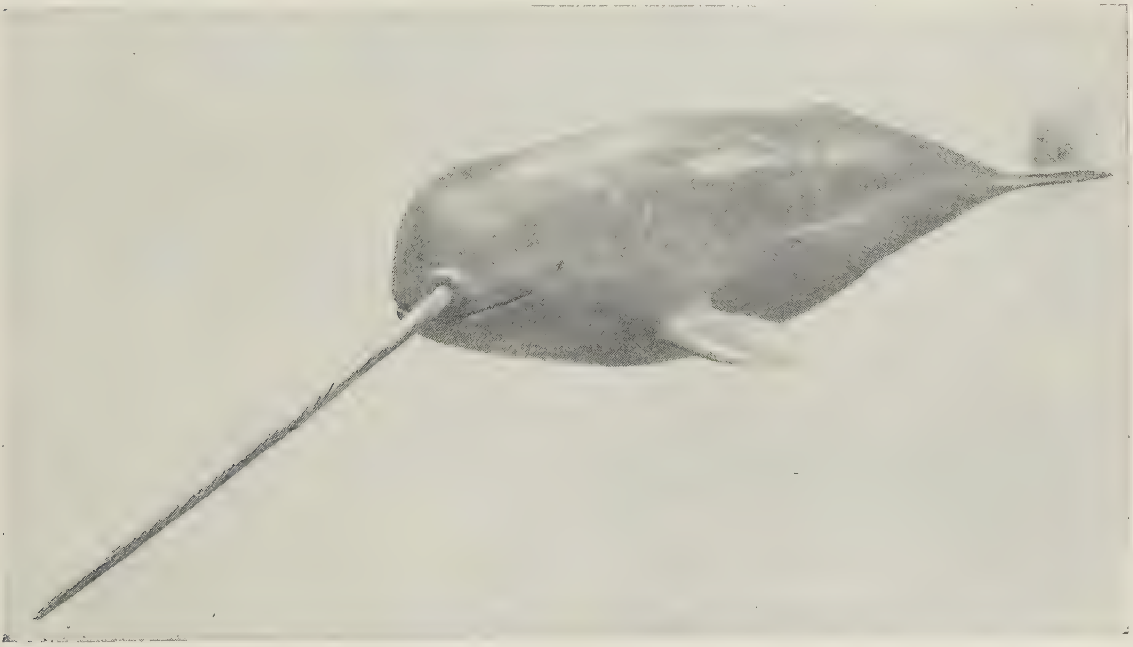


Photo by A. S. Rudland & Sons

NARWHAL

An Arctic whale, with one or rarely two long spears of bone projecting from the head no gills. Fishes, in the vast majority of cases, reproduce their young by spawning, the eggs being left to hatch out either in gravel-beds or among the water-plants, lying on the bottom (as in the case of the herring), or floating near the surface (as in that of the plaice): whales do not lay eggs, but bear the young alive. This brings us to the simple points of resemblance between them and other mammals. When the young whale is born, it is nourished on its mother's milk. This alone would constitute its claim to a place among the highest class. Whales breathe atmospheric air by means of lungs. Hair is peculiarly the covering of mammals, just as scales are characteristic of fishes and feathers of birds. Many whales, it is true, have no hair; but others, if only in the embryonic stage, have traces of this characteristic mammalian covering. It must, moreover, be remembered that in some other orders of mammals the amount of hair varies considerably — as, for instance, between the camel and rhinoceros.

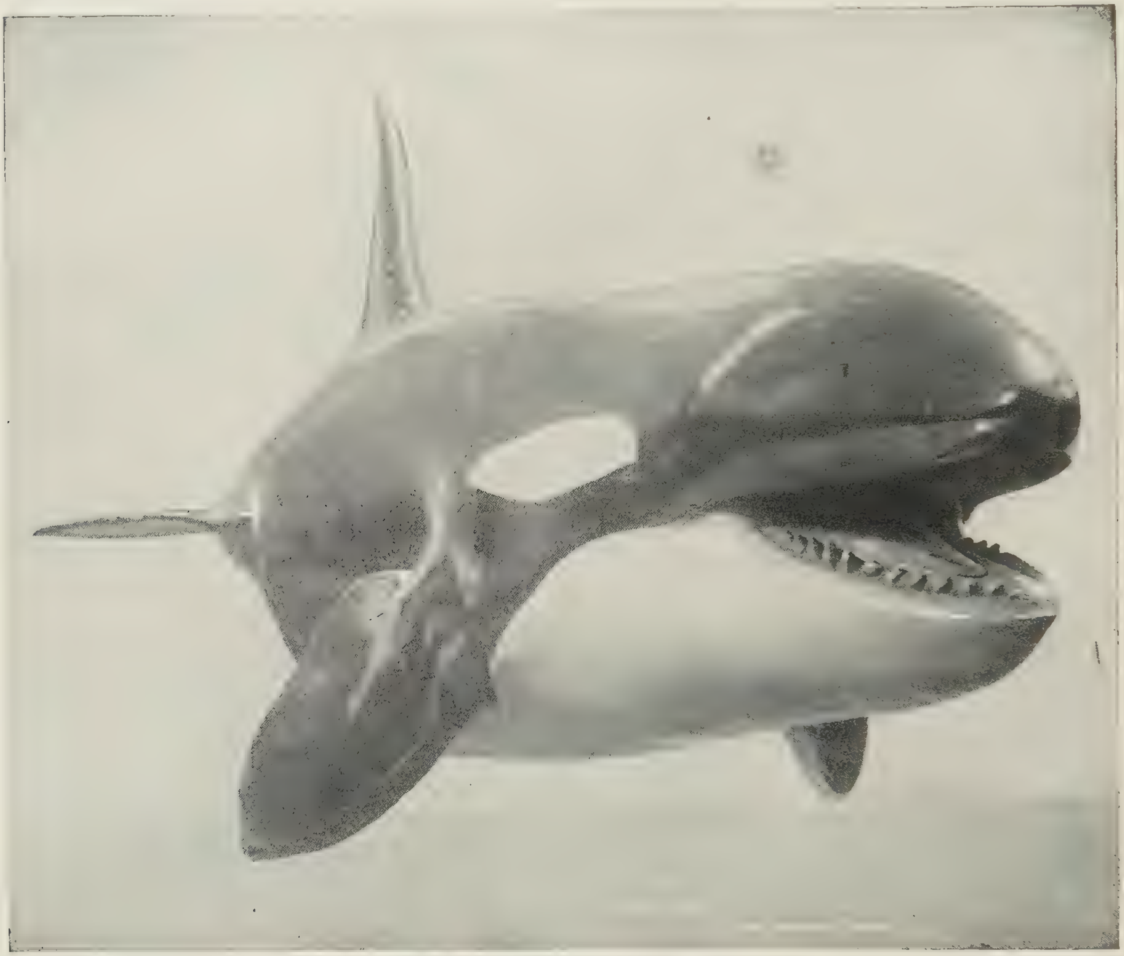


Photo by A. S. Rudland & Sons

GRAMPUS, OR KILLER

A carnivorous cetacean with large teeth, often found in the North Sea

Having, then, shown that whales are mammals, we must now determine the chief features of the more typical members of the order. The extremities of whales are characteristic: a large head, occupying in some species as much as one-third of the total length; and the afore-mentioned forked, or lobed, tail set laterally. The flippers, which bear only a slight resemblance to the pectoral fins in fishes, are in reality hands encased in swimming-gloves. In some whales these hands are five-fingered, in others the fingers number only four, but many of the fingers contain more bones than the fingers of man. In some whales we find a dorsal fin, and this, as also the flippers, acts as a balancer. In no whale or porpoise is there any external trace of hind limbs, but the skeleton of some kinds shows in varying stages of degradation a rudimentary bone answering to this description. Perhaps, however, the most distinctive feature of whales is the blow-hole, situated, like the nostrils of the hippopotamus, on the upper surface of the head, and similarly enabling the animal to breathe the air without exposing much of its head above the surface of the water. The blow-hole (or blow-holes, for whalebone-whales have two) may be said to take the place of nostrils as regards the breathing, though perhaps no sense of smell is included in its functions. In the Sperm-whale, or Cachalot, there is a single ∽-shaped blow-hole near the end of the snout. The well-known spouting of whales is merely the breathing out of warm vapour, which, on coming in contact with the colder air — and it should be remembered that most whaling is carried on in the neighbourhood of icebergs — condenses in a cloud above the animal's head. I have seen many a sperm-whale spout, and the cloud of spray, often mixed with a varying volume of water if the whale commences to blow before its blow-hole is clear of the surface, drifts forward over the forehead. This is due to the forward position of the blow-hole. I never to my knowledge saw a whalebone-whale spouting, but its double jet is said to ascend vertically over its back, and this would in like manner be accounted for by the more posterior position of the blow-holes. Having filled its lungs, which are long and of simple structure, with fresh air, in enormous draughts that fill the great cavities of its chest, the whale sinks to the depths. There, in ordinary circumstances, it will lie for a quarter of an hour or more, but the pain of the harpoon and the knowledge that there is danger at the surface may keep it below for as much as an hour. When it has to breathe again, a few powerful strokes from the laterally set tail suffice to bring it quickly to the surface. This is not the place for a detailed anatomy of the whale, but no one can fail to notice with admiration such parts of its equipment for the battle of life as the structure of its windpipe, which enables it to breathe with comfort with its mouth full of water, the complicated network of blood-vessels that ensures the slow and thorough utilising of all the oxygen in its lungs while it remains at the bottom, and the elastic cushion of blubber that makes this gigantic animal indifferent to extremes of pressure and temperature. Thanks mainly to its coat of blubber, the whale exists with equal comfort at the surface or hundreds of fathoms below it; in the arctic or in tropical seas.

It is not perhaps in keeping with the plan of this work that we should consider in detail the soft parts of the whale's inside. One or two parts of its feeding and digestive mechanism may, however, offer some points of passing interest. The complex stomach, which is divided into chambers, like that of the ruminants already described, has suggested that the latter function

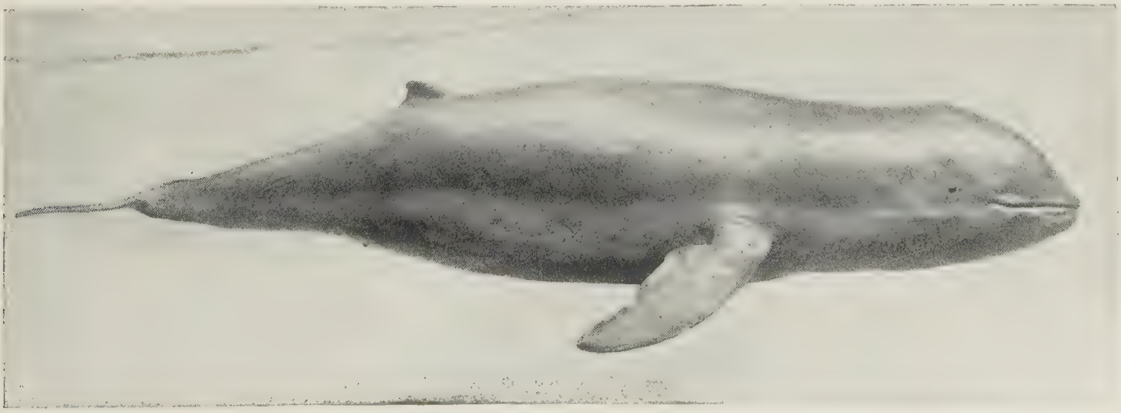


Photo by A. S. Rudland & Sons

SHORT-BEAKED RIVER-DOLPHIN

In this type the head is produced into a beak, supported in the upper jaw by a mass of ivory-like bone may in a modified process be performed by whales. It is, however, evident that the teeth of toothed whales are in no way adapted to the act of mastication, which is inseparable from any conception of ruminating, while the toothless whales have as complicated a stomach as the rest. Mr. Beddard, writing on the subject in his interesting "Book of Whales," takes the more reasonable view that the first chamber of the stomach of whales should be regarded rather as a storehouse in which the food is crushed and softened. The teeth of whales, the survival of which in the adult animal offers the simplest basis of its classification under one or other of the two existing groups, or sub-orders, are essentially different from the teeth of many other kinds of mammals. It cannot, perhaps, be insisted that the distinctive terms employed for these two categories of whales are wholly satisfactory. For instance, the so-called "toothless" whales have distinct teeth before birth, thus claiming descent from toothed kinds. On the other hand, the so-called "toothed" whales are by no means uniformly equipped in this respect, some of the porpoises having as many as twenty-six teeth, distributed over both jaws, while the bottlenoses have no more than two, or at most four, and these in the lower jaw only. Only the lower jaw, in fact, of the great sperm-whale bears teeth that are of any use, though there are smaller and functionless teeth in the gums of the upper. The teeth of whales, by the way, are not differentiated like our canines and molars, but are all of one character. Although, in "toothless" whales, the fœtal teeth disappear with the coming of the baleen, or whalebone, the latter must not, in either structure or uses, be thought to take their place. The plates of whalebone act rather as a hairy strainer. Unless we seek a possible analogy at the other end of the mammalian scale, in the Australian duck-bill, the feeding of the whalebone-whales is unique. They gulp in the water, full of *plankton*, swimming open-mouthed through the streaks of that substance. Then the huge jaws are closed, and the massive tongue is moved slowly, so as to drive the water from the angles of the mouth through the straining-plates of baleen, the food remaining stranded on these and on the tongue. The size and number of the baleen-plates appear to vary in a degree not yet definitely established; but there may, in a large whale, be as many as between 300 and 400 on either side of the cavernous mouth, and they may measure as much as 10 or 12 feet in length and 7 or 8 feet in width.

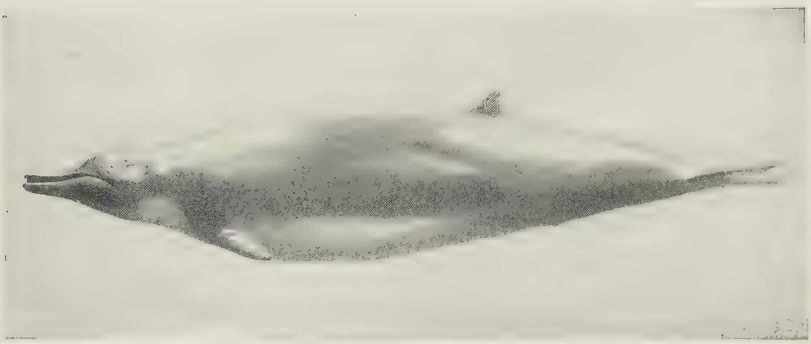


Photo by A. S. Rudland & Sons

SOWERBY'S BEAKED WHALE

One of the rarest of whales. It probably inhabits the open seas

An enumeration of such whales and porpoises and dolphins as have at one time or other been stranded on the shores of the British Isles may serve as an epitome of the whole order. Only one interesting group, in fact — the River-dolphins of the Ganges and Amazons — is unrepresented in the list. Whales, either exhausted or dead, are periodically thrown up on our coasts, even on the less-exposed portions — one of the most recent examples in the writer's memory being that of a large specimen, over 60 feet long, stranded on the sands near Boscombe, in Hampshire, and the skeleton of which at present adorns Boscombe Pier. It was one of the rorquals, or finbacks, probably of the species called after Rudolphi; but the skeleton is imperfect, though its owner, Dr. Spencer Simpson, appears to have preserved some details of its earlier appearance. It should be remembered that many of the following can only be regarded as "British" with considerable latitude, the records of their visits being in some cases as rare as those of the rustic bunting and red-necked nightjar among birds, or of the derkio and spotted dragonet among fishes.

British zoologists, however, usually include the following: — Whalebone-whales: Southern Right-whale; Humpback; Finbacks, or Rorquals. Toothed Whales: Sperm-whale, or Cachalot; Narwhal; Beluga, or White Whale; Grampuses; Beaked Whale; Broad-fronted Whale; Cuvier's Whale; Sowerby's Whale; Pilot-whale; Porpoise; Dolphin; White-sided Dolphin; White-beaked Dolphin; Bottlenose.

A selection may therefore be made of five of the most representative of these species — the Southern Whale, the Cachalot, the Narwhal, the Porpoise, and the Dolphin.

The Southern Whale, which, in common with the closely allied polar species, whaling-crews call "right," seeing that all other kinds are, from their point of view, "wrong," is probably the only right-whale which has ever found its way to our shores. Some writers include the Greenland Right-whale, but their authority for this is doubtful. It is said to grow to a length of at any rate 70 feet, though 55 feet would perhaps be more common for even large specimens. In colour it is said to be dark above, with a varying amount of white or grey on the flippers and under-surface. The head and mouth are very large, occupying in some cases one-third of the total length, and the baleen-plates measure as much as 8 or 10 feet in length and 5 or 6 feet in width. The species has no back-fin, but there is a protuberance on the snout, known technically as the "bonnet." This whale appears to give birth to its single calf some time in the spring months, and the mother shows great affection for her offspring. The Humpback is distinguished from the right-whales externally by its longer flippers and the prominence on its back, and internally by the fluted skin of the throat. The Finners, or Rorquals, have a distinct back-fin. They feed on fishes and cuttles, and I have more than once known a rorqual, which looked fully 50 feet long (comparing it roughly with my 24-foot boat), to swim slowly round and round my lugger, down on the Cornish coast, puffing and hissing like a torpedo-boat on its trial trip, rounding up the pilchards in a mass, and every now and then dashing through them open mouthed with a terrific roar, after several of which helpings it would sink out of sight and not again put in an appearance.

The Sperm-whale, or Cachalot, may serve as our type of the toothed whales. It attains to the same great dimensions as the largest of the whalebone group. A more active

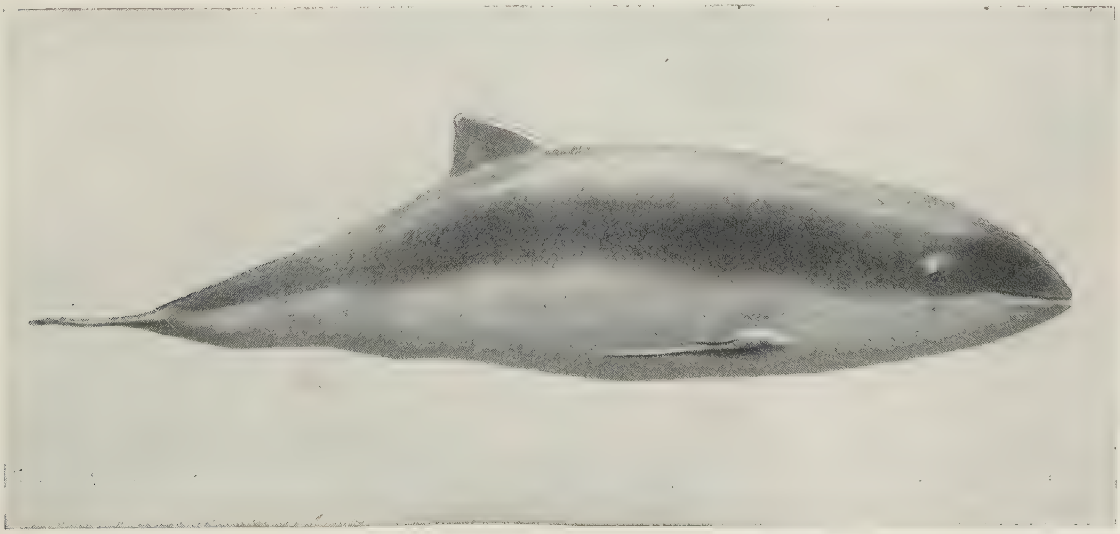


Photo by A. S. Rudland & Sons

COMMON PORPOISE

From 4 to 5 feet long. It lives in "schools," or companies, and pursues the herrings and mackerel animal for its size could scarcely be conceived; and I have seen one, in the Indian Ocean, fling itself three or four times in succession out of water like a salmon, striking the surface each time as it fell back with a report like that of a gun. No one appears to have explained whether performances of this sort are due to mere playfulness, or, as seems more probable, to the attacks of parasites or such larger enemies as sharks or "killers." I have also seen four thresher-sharks leaping out of water, and falling with a loud blow on the whale's back; but the victim lay quite still in this case, and may in fact have been worn out before we came upon the scene. I wish to add that I took the word of the skipper, himself an old whaling-captain, for their identity as threshers. The dazzling sun shone full on them, and on the sea between, and it was impossible, even with the ship's telescope, to recognise them with any accuracy. The cachalot has a very different profile from what any one who had seen only its skull in a museum would be led to expect, for the sperm-cavity in the forehead is not indicated in the bones. The structure of the head enables the animal to drop the lower jaw almost at right angles to the upper; and Mr. Frank Bullen quotes, in his fascinating "Cruise of the Cachalot," the current belief that it does so to attract its prey by the whiteness of its teeth and palate. Although both fishes and cephalopods are very curious, even to their own destruction, it is doubtful whether the whale could not catch its food more rapidly by swimming open-mouthed through the acres of floating squid encountered all over the warmer waters of the ocean.

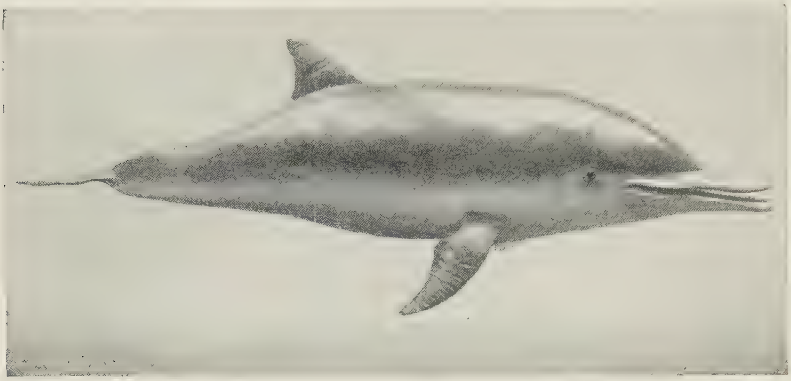


Photo by A. S. Rudland & Sons

ELLIOTT'S DOLPHIN

One of the commoner Indian species

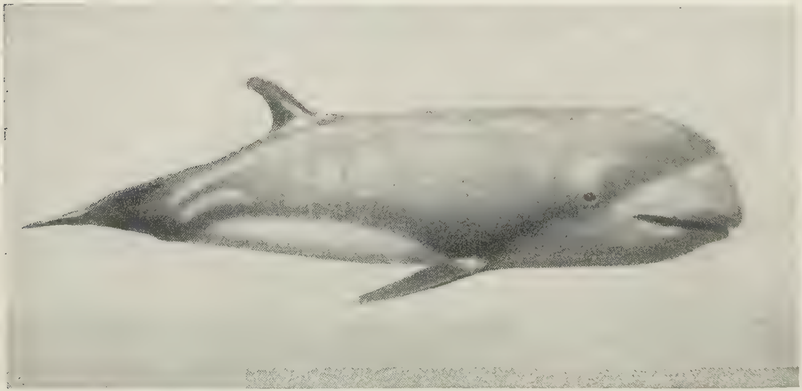


Photo by A. S. Rudland & Sons

RISSO'S DOLPHIN

About 13 feet in length, found in almost all oceans

The NARWHAL, an arctic type, may be distinguished from all other cetaceans by the single spiral tusk in the left side of the head of the male. Sometimes the right tusk grows as well, and either may attain a length of as much as 8 feet; but in the female both teeth remain undeveloped.

The COMMON PORPOISE of our own seas, distinguished by its rounded head from the equally common beaked dolphin, is too familiar to need much description. It grows to a length of 5 or 6 feet, and is dark in colour on the back and white beneath. Its conspicuous back-fin is always recognisable when it gambols with a herd of its fellows; and a line of these sea-pigs, a mile or so in length, is no uncommon sight, their presence inshore being indicative on some parts of the coast of the coming of east wind. The porpoise, which has,

Photo by A. S. Rudland & Sons

BOTTLE-NOSED DOLPHIN

From 8 to 9 feet long, found from the Mediterranean to the North Sea

like many of its group, teeth in either jaw, is a voracious feeder, preying in estuaries on salmon and flounders, and on more open parts of the coast on pilchards and mackerel. It is occasionally a serious nuisance in the Mediterranean sardine-fisheries, and I have known of the fishermen of Collioure, in the Gulf of Lyons, appealing to the French Government to send a gunboat from Toulon that might steam after the marauders and frighten them away. One of the most remarkable cases of a feeding porpoise that I can recall was that of one which played with a conger-eel in a Cornish harbour as a cat might play with a mouse, blowing the fish 20 or 30 feet through the air, and swimming after it so rapidly as to catch it again almost as it touched the water.

The DOLPHIN, which is in some seasons as common in the British Channel as the more familiar porpoise, is distinguished by its small head and long beak, the lower jaw always carrying more teeth than the upper. It feeds on pilchards and mackerel, and, like the porpoises, gambols, particularly after an east wind, with its fellows close inshore. There are many other marine mammals somewhat loosely bracketed as dolphins. RISSO'S DOLPHIN, for instance, a rare visitor to our coasts, has a striped skin, and its jaws are without teeth, which distinguish it from the common dolphin and most of the others. It cannot therefore feed on fishes, and most probably eats squid and cuttle-fish. The BOTTLE-NOSED DOLPHIN, a species occurring in the greatest numbers on the Atlantic coast of North America, is regularly hunted for its oil. HEAVYSIDE'S DOLPHIN, which hails from South African waters, is a smaller kind, chiefly remarkable for the curious distribution of black and white on its back and sides.

A word must, in conclusion, be said on the economic value of the whales. Fortunately, as they are getting rarer, substitutes for their once invaluable products are being from time to time discovered, and much of the regret at their extermination by wasteful slaughter is sentimental and not economic. For whalebone it is not probable that a perfect substitute will ever be found. It therefore maintains a high price, though the former highest market value of over $10,000 per ton has fallen to something nearer the half. The sperm-oil from the sperm-whale, and the train oil from that of the right-whales, the spermaceti out of the cachalot's forehead and the ambergris secreted in its stomach, are the other valuable products. Ambergris is a greyish, fatty secretion, caused by the irritation set up in the whale's inside by the undigested beaks of cuttle-fish. Its market price is about $25 per ounce. A lump of 240 lbs. sold for nearly $100,000.

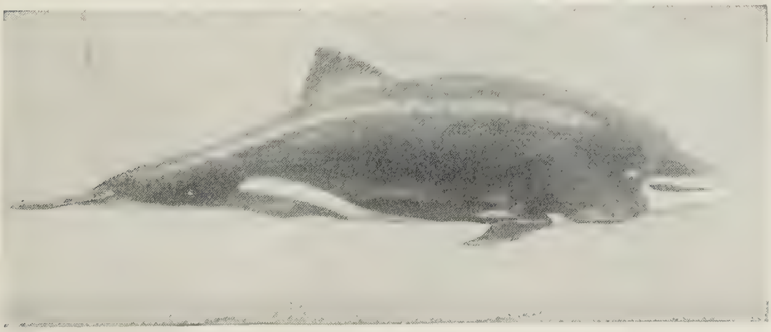


Photo by A. S. Rudland & Sons

HEAVYSIDE'S DOLPHIN

A small, peculiarly coloured species from the Cape

CHAPTER XXI

THE SLOTHS, ANT-EATERS, AND ARMADILLOS

BY W. P. PYCRAFT, A. L. S., F. Z. S.

THE very remarkable assemblage of animals we are now about to consider includes many diverse forms, bracketed together to constitute one great group; and this on account of the peculiarities of the structure and distribution of the teeth, which are never present in the front of the jaw, and may be absent altogether. Of the five groups recognised three occur in the New and two in the Old World. All have undergone very considerable modification of form and structure, and in every case this modification has tended to render them more perfectly adapted to an arboreal or terrestrial existence. Flying or aquatic types are wanting. Whilst one great group — the Sloths — is entirely vegetarian, the others feed either on flesh or insects.

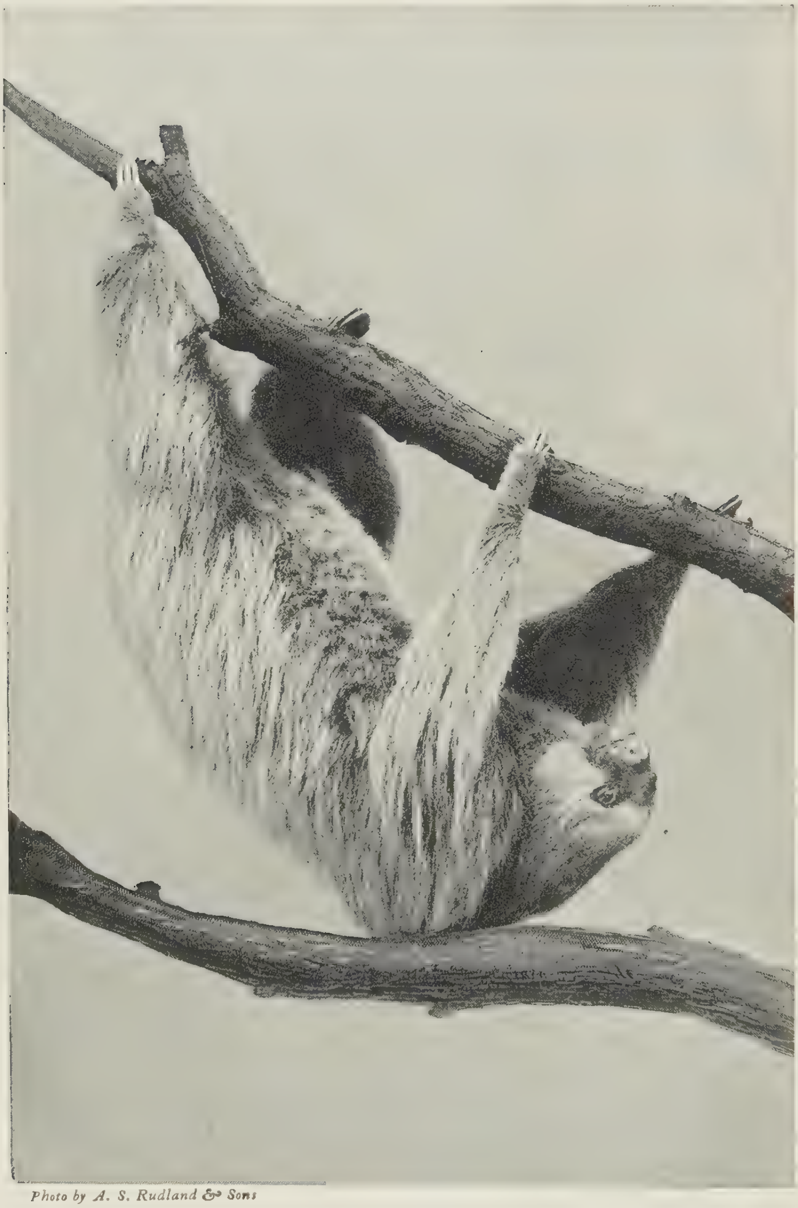


Photo by A. S. Rudland & Sons

NORTHERN TWO-TOED SLOTH (COSTA RICA)

This is also known as Hoffmann's Sloth. The appellation "two-toed" refers to the fore limb only. The hind foot has three toes

THE SLOTHS

In the matter of personal appearance Nature has not been kind to the SLOTH, though it is certainly true that there are many uglier animals — not including those, such as some of the Monkey Tribe and certain of the Swine, which are positively hideous. The mode of life of the sloth is certainly remarkable, for almost its whole existence is passed among the highest trees of the densest South American forests, and passed, too, in a perfectly topsy-turvy manner, inasmuch as it moves from bough to bough with its legs up in the air and its back towards the ground. It walks and sleeps suspended beneath the boughs instead of balanced above them, securely holding itself by means of powerful hooked claws on the fore and hind feet. This method of locomotion, so remarkable in a mammal, coupled with the deliberate fashion in which it moves, and the air of sadness expressed in its quaint physiognomy — large-eyed, snub-nosed, and earless — on which there seems to dwell an ever-present air of resignation, led the great Buffon to believe that the sloth was a creature afflicted of God for some hidden reason man could not fathom! His sympathy was as certainly wasted as his hasty conclusion was unjustified. There can be no doubt but that the life led by the sloth is at least as blissful as that of its more lively neighbours — the spider monkeys, for instance. Walking beneath the boughs comes as natural to the sloth as walking on the ceiling to the fly.

The sloth sleeps, as we have already remarked, suspended from a bough. During this time the feet are drawn close together, and the head raised up and placed between the fore legs, as in the cobego, which we depicted asleep on page 148, as our readers will remember. In the sleeping position the sloth bears a striking resemblance to the stump of a lichen-covered bough, just as the cobego resembles a fruit. Thus is protection from enemies gained. The resemblance to lichen is further aided by the fact that the long, coarse hair with which the sloth is clothed becomes encrusted with a peculiar green alga — a lowly form of vegetable growth — which lodges in certain grooves or flutings peculiar to the hair of this animal. Such a method of protection is unique amongst the Mammalia. As the sloths sleep by day and feed by night, the usefulness of such a method of concealment is beyond question.

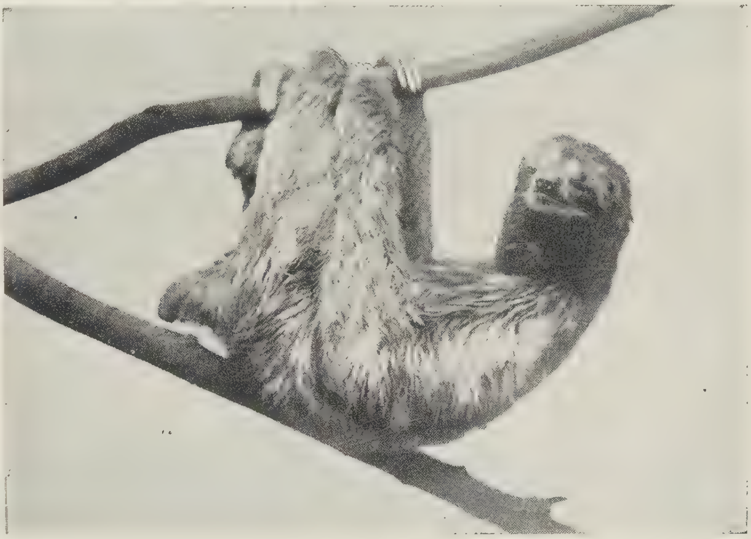


Photo by L. Medland, F.Z.S.

THREE-TOED SLOTH

A remarkable peculiarity about the three-toed sloths is the fact that they have no less than nine vertebræ in the neck, instead of seven, as is usual among mammals

The strange form of locomotion of the sloths renders separate fingers and toes unnecessary, and so the fingers and toes have come to be enclosed in a common fold of skin, extending down to the base of the claws.

The sloths stand out in strong contrast to the volatile spider monkeys, with whom they share the forest; these have added a fifth limb in the shape of a prehensile tail, by which they may suspend themselves at will. The sloths, on the contrary, have no tail; they move deliberately, and do not require it. The monkeys move by prodigious leaps, taken not seldom by gathering impetus by swinging on their tails.

The great naturalist Bates writes of the sloth: " It is a strange sight to watch this uncouth creature, fit production of these silent shades, lazily moving from branch to branch. Every movement betrays, not indolence exactly, but extreme caution. He never loses his hold from one branch without first securing himself to the next. . . . After watching the animal for about half an hour, I gave him a charge of shot; he fell with a terrific crash, but caught a bough in his descent with his powerful claws, and remained suspended. Our Indian lad tried to climb the tree, but was driven back by swarms of stinging ants; the poor little fellow slid down in a sad predicament, and plunged headlong into the brook to free himself."

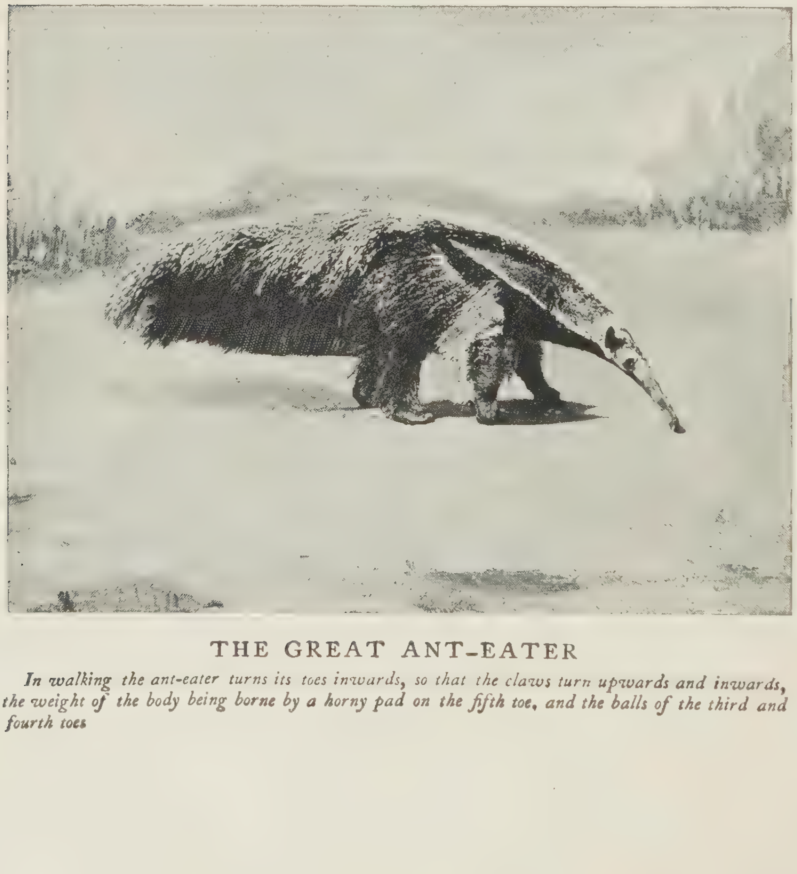
On another occasion the same writer tells us he "saw a sloth swimming across a river at a place where it was 300 yards broad. I believe it is not generally known that this animal takes to the water. Our men caught the beast, cooked and ate him."

In past ages gigantic ground-sloths roamed over South America. The largest of these, the Megatherium, rivalled the elephant in size. Descendants of these giants appear to have lingered on till comparatively recent times, as witness the wonderful discovery by Moreno, made during the year of 1900, in a cave in Patagonia. This was nothing less than a skull and a large piece of the hide of one of these monsters in a wonderful state of preservation, showing indeed undoubted traces of blood and sinew. That the hide was removed by human hands there can be no doubt, for it was *rolled up* and turned inside-out. Immediately after this discovery was announced, an expedition was dispatched from England to hunt, not so much for more remains, but for the animal itself. Time will show whether these efforts will prove successful.

THE ANT-EATERS

Unlike as the ant-eaters are to the sloths, they are nevertheless very closely related thereto. This unlikeness at the present day is so great that, were it not for "missing-links" in the shape of fossils, we should probably never have discovered the relationship. The head of the typical ant-eaters has been drawn out into a long tubular muzzle, at the end of which is a tiny mouth just big enough to permit the exit of a long worm-like tongue, covered with a sticky saliva. This tongue is thrust out with great rapidity amongst the hosts of ants and termites and their larvæ, on which they prey. These victims are captured by breaking open their nests. At once all the active inhabitants swarm up to the breach, and are instantaneously swept away by the remorseless tongue. The jaws of the ant-eaters are entirely toothless, and the eyes and ears are very small.

The largest species of ant-eater is about 4 feet long. It lives entirely upon the ground. Generally speaking, it is a harmless creature; but at times, when cornered, it will fight furiously, sitting up on its hind legs and hugging its foe in its powerful arms. Bates, the traveler-naturalist, relates an instance in which a dog used in hunting the GREAT ANT-EATER was caught in its grip and killed. The tail of this large species is covered with very long hair, forming an immense brush. The claw on the third toe of each fore limb is of great size, and used for breaking open ants' and other insects' nests.



THE GREAT ANT-EATER

In walking the ant-eater turns its toes inwards, so that the claws turn upwards and inwards, the weight of the body being borne by a horny pad on the fifth toe, and the balls of the third and fourth toes

But besides the great ground ant-eater there are some tree-haunting species. These have a shorter muzzle, and short hair on the tail, which is used, as with the spider monkeys, as a

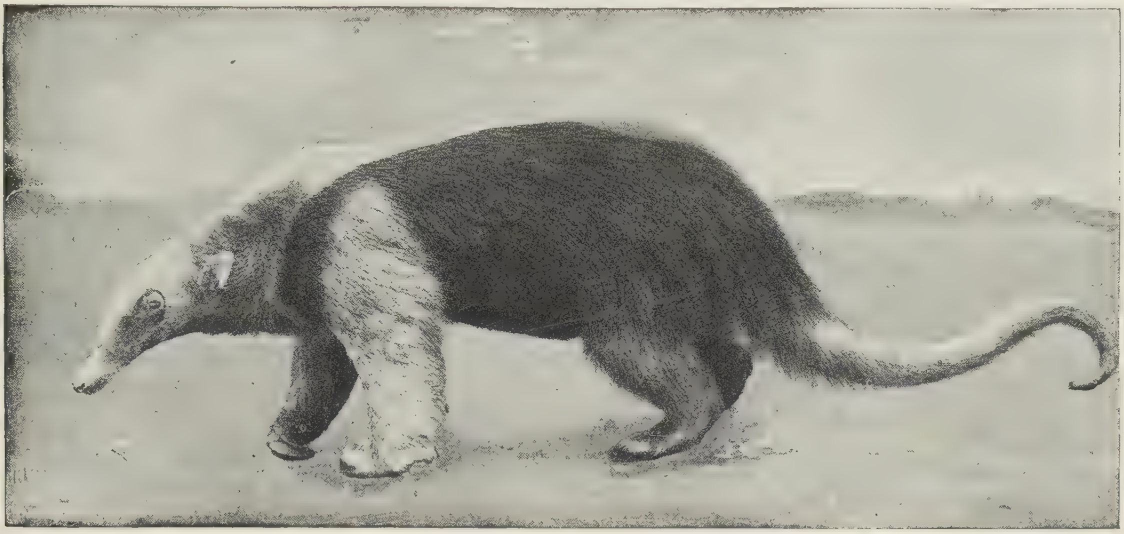


Photo by A. S. Rudland & Sons

TAMANDUA ANT-EATER

This species, which is a smaller animal than the Great Ant-eater, lives almost entirely in the trees, instead of on the ground

fifth limb. Curled round the bough of a tree, its owner is free to swing himself out on to another branch.

The smallest of the tree-dwelling species is not larger than a rat, and is a native of the hottest parts of the forests of South and Central America. The muzzle in this species is quite short, not long and tubular, as in the larger species. It is a very rare animal, or is at least very seldom seen, a fact perhaps due to its small size. It is known as the TWO-TOED ANT-EATER, only the second and third fingers of the fore feet bearing claws.

Von Sack, in his "Narrative of a Voyage to Surinam," tells us that the natives of Surinam call this little animal "Kissing-hand"—"as the inhabitants pretend that it will never eat, at least when caught, but that it only licks its paws, in the same manner as the bear; that all trials to make it eat have proved in vain, and that it soon dies in confinement. When I got the first, I sent to the forest for a nest of ants; and during the interim I put into its cage some eggs, honey, milk, and meat; but it refused to touch any of them. At last the ants' nest arrived, but the animal did not pay the slightest attention to it either. By the shape of its fore paws, which resemble nippers, I thought that this little creature might perhaps live on the nymphæ of wasps, etc. I therefore brought it a wasps' nest, and then it pulled out with its nippers the nymphæ from the nest, and began to eat them with the greatest eagerness, sitting in the posture of a squirrel. I showed this phenomenon to many of the inhabitants, who all assured me that it was the first time they had ever known that species of animal take any nourishment."

THE ARMADILLOS

Readers of this book will doubtless have noticed long ere this how manifold are the devices for the purpose of defence adopted by the Mammalia. The ARMADILLOS have certainly selected the most complete, having encased themselves in an impenetrable bony armour as perfect as the coat of mail of the warrior of the Middle Ages. Concerning this and the variations thereon adopted by the different members of the group we shall speak presently.

Armadillos are mostly confined to South America, and occur both in the open pampas and the shady depths of the forest. They live in burrows, which they dig with incredible speed. These burrows are generally found in the vicinity of the nests of ants and termites, which form their staple diet. One species, however, at least feeds apparently with equal relish upon vegetable matter, eggs, young birds, mice, snakes, and carrion.

The bony armour is disposed over the crown of the head, back, and flanks. It is made up of numerous small, bony plates, buried deep in the skin, and each overlaid by a horny scale. The tail is protected by bony rings. The plates covering the shoulders and those directly over the hindquarters fuse into a solid mass, thus forming chambers into which the limbs can be withdrawn. In the region of the body, between these two shields, the plates are arranged in rows encircling the body, thus permitting the animal to roll itself up as occasion may require. Hairs grow out between the plates, and in some cases give the animal quite a furry appearance.

Speaking of the burrowing powers of the armadillo, Darwin, in his most fascinating "Voyage of the Beagle," tells us that "the instant one was perceived, it was necessary, in order to catch it, almost to tumble off one's horse; for in soft soil the animal burrowed so quickly that its hinder quarters would almost disappear before one could alight. It seems almost a pity to kill such nice little animals; for as a Gaucho said, while sharpening his knife on the back of one, 'Son tan mansos' (They are so quiet)." As a rule, armadillos are regarded as animals loving dry, sandy wastes; nevertheless, they are said to be able to swim both well and swiftly. The flesh of the armadillo is apparently by no means unpalatable.

THE PICHICIAGO

One of the most remarkable of the armadillos is the PICHICIAGO, or FAIRY ARMADILLO. It is a tiny creature of some 5 inches long, found in the sandy wastes of the western part of the Argentine Republic. The horny covering of the bony plates is pinkish colour, and the hair is silky in texture and snow-white. But it is not on this account that the fairy armadillo is remarkable: its claim to notoriety rests on the peculiar arrangement of the bony plates constituting the armour. These bony plates are small and thin, and covered, as in other species, with a horny coat; but instead of being embedded in the skin, they are attached only along the middle of the back, and project freely over the body on either side, leaving a space between the shield and the body. The hinder end of the body is specially protected by a nearly circular vertical shield, firmly fixed to the hip-girdle. This shield, it is said, is used as a plug to fill up its burrow with.

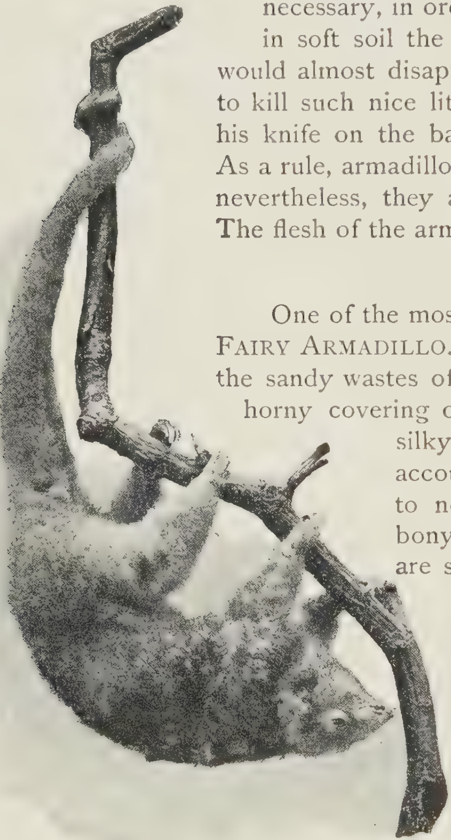


Photo by A. S. Rudland & Sons

TWO-TOED ANT-EATER

Although the fore feet have four toes, only the second and third bear claws; hence the name "Two-toed" Ant-eater

THE PELUDO

Armadillos of the normal type, wherein the body armour is embedded in the skin, are represented by numerous species. Of one, known as the PELUDO, Mr. Hudson has given us some interesting details. "It feeds," he tells us, "not only upon insects, but also upon vegetable matter, eggs, young birds, and carrion. Its method of capturing mice was certainly ingenious. It hunted by smell, and when nearing its prey became greatly agitated. The exact spot discovered, the body was raised slowly to a sitting posture, and then flung suddenly forwards, so that the mouse or nest of mice was imprisoned beneath, and promptly dispatched." "Still more remarkable," says Mr. Lydekker, "is the manner in which a peludo has been observed to kill a snake, by rushing upon it and proceeding to saw the unfortunate reptile in pieces by pressing upon it closely with the jagged edges of its armour, and at the same time moving its body backwards and forwards. The struggles of the snake were all in vain, as its fangs could make no impression upon the panoply of its assailant, and eventually the reptile slowly dropped and died, to be soon afterwards devoured by the armadillo, which commenced the meal by seizing the snake's tail in its mouth, and gradually eating forwards."

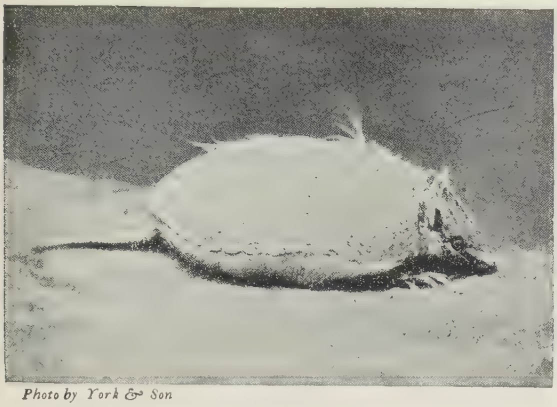


Photo by York & Son

WEASEL-HEADED ARMADILLO

The weasel-headed armadillos have from six to eight movable bands in the bony armour in which they are encased

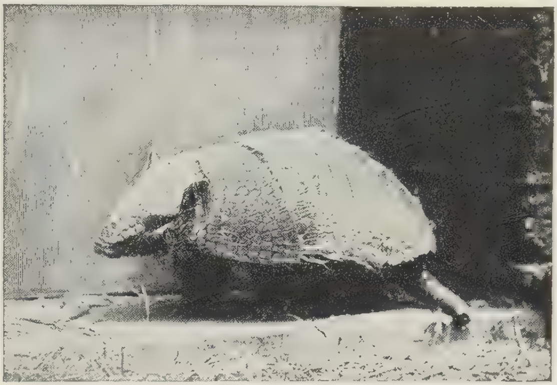


Photo by L. Medland, F.Z.S.

HAIRY-RUMPED ARMADILLO

This species, like the Peba Armadillo, varies its diet with carrion

The Pangolins

The Pangolins, or Scaly Ant-eaters, are perhaps even more curious creatures than the armadillos. They have been likened in appearance to animated spruce fir-cones, to which indeed they bear a strange resemblance. This resemblance is due to the wonderful armature of the skin, which takes the form of large overlapping, pointed, horny plates or scales. The pangolins are confined to the Old World, occurring in South Africa and South-eastern Asia. Like the American Ant-eaters, teeth are wanting, and the tongue is long and worm-like, being employed in the capture of insects, as in the New World ant-eaters.

The scales of the Manis are formed by the fusion together of fine hairs. Like the spines of the hedgehog and porcupine, they serve the purpose of offensive defence; for when the manis rolls itself up, these pointed scales project at right angles to the body, and offer a formidable resistance to any enemy whatsoever. They also serve to break the force of a fall, which, indeed, is often voluntary; for should the animal wish to descend from the branch of a tree, it will often take a short cut to the ground by deliberately dropping, the force of the fall being entirely broken by the elastic scales.

In climbing, the tail is of the greatest service, its under-surface being clothed with pointed scales, which serve as so many climbing-hooks. The grasp of a tree-trunk gained by the hind legs and tail is so secure that the body can be moved to a horizontal position with ease. In a specimen kept in captivity by Mr. Fraser, this horizontal movement was a form of exercise which appeared to afford the greatest pleasure.

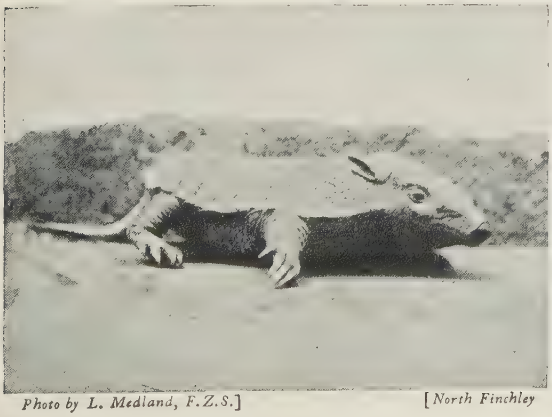


Photo by L. Medland, F.Z.S.] [North Finchley

PEBA ARMADILLO

This species lives largely upon carrion, which it buries in its burrow till wanted

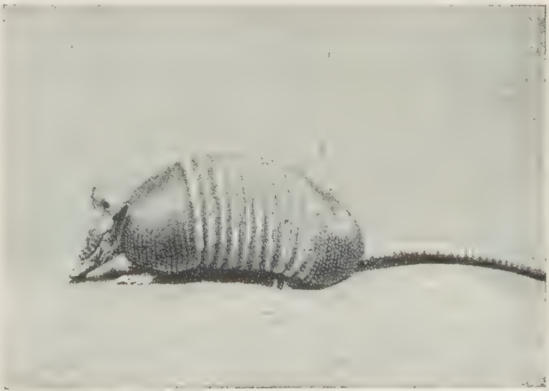


Photo by York & Son] [Notting Hill

KAPPLERS' ARMADILLO

This is a variety of the Peba Armadillo, inhabiting Surinam

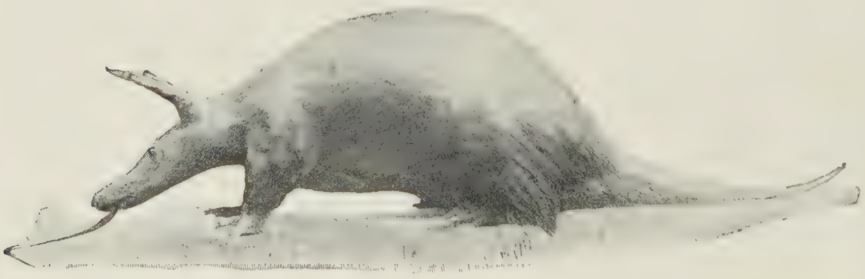
THE AARD-VARK

The custom of naming newly discovered animals after well-known forms to which they are supposed to bear some resemblance, physically or otherwise, is a common one. The animal now under consideration shows this once more, having originally received the name of AARD-VARK (Earth-pig) from the Boers of the Cape. The aard-vark is a most decidedly ugly animal, and justifies its name in several particulars. It is hunted for the sake of its hide, which is of great thickness and resembles that of the pig, but is sparsely covered with hairs, the general shape of its body being not unlike that of a long-headed, short-legged, heavy-tailed pig. The whole animal is about 6 feet long. In a wild state, or even in captivity, it is but rarely seen, since it is a night-feeder, and passes the day in sleep deep down in a burrow. This burrow it digs for itself with the aid of powerful claws borne on the fore feet. It lives principally on ants and termites, breaking down their nests, and remorselessly sweeping up the frightened occupants with a long, sticky tongue, as soon as they rush to the seat of the disturbance which has broken up the harmony and order of their community. At one time it was believed that the aard-vark was a close ally of the pangolin, but later researches have disproved this, and have furthermore thrown doubt upon the probability of its relationship with any of the members of this group of mammals at all.

There are two species of this animal — the CAPE AARD-VARK of South and South-east Africa, and the ETHIOPIAN AARD-VARK of North-east Africa.

Where the nest-building ants are most common, there will the aard-vark — or Innagus, as the Boers sometimes call it — be most plentiful. The nests of these ants are huge structures of from 3 to 7 feet high, and often occupy vast areas of ground, extending as far as the eye can reach. They are substantially built, and swarm with occupants, and consequently are quite worth raiding. But the aard-vark has become much less common since a price has been set upon its skin. The powers of digging of these animals are so great that they can completely bury their large bodies in a few minutes, even when the ground has been baked by the sun into something like adamantine hardness. In excavating their burrows, the ground is thrown out by the fore feet, in huge lumps, through or rather between the hind legs. Shy and suspicious, the least unusual sound will send them scuttling to earth, for their sense of hearing is very keen. They seem to change their minds somewhat frequently, when engaged in digging out a new burrow; for half-excavated burrows in the side of ant-hills are very commonly met with. A fully grown aard-vark is about 6 feet long — generally rather more. Although this animal is frequently kept in captivity, it is but rarely seen by visitors, owing to its nocturnal habits, of which we have already spoken.

The teeth of the aard-vark are sufficiently remarkable to justify notice here. Only the crushing teeth are represented — that is to say, the front or cutting teeth are conspicuous by their absence. These crushing teeth number from eight to ten in the upper and eight in the lower jaw, on each side; but in the adult fewer would be found, the number being reduced to five in each side of the jaws — that is to say, there are but twenty all told. In structure these teeth are quite remarkable, differing entirely from those of all other mammals, and resembling those of some fishes; furthermore, they have no "roots," but instead grow continually throughout life, which "rooted" teeth do not.



By permission of the Hon. Walter Rothschild

CAPE AARD-VARK

The ants upon which the aard-vark largely subsists appear to be very fattening, and impart a delicate flavour to the flesh, especially to the hams, which are greatly esteemed

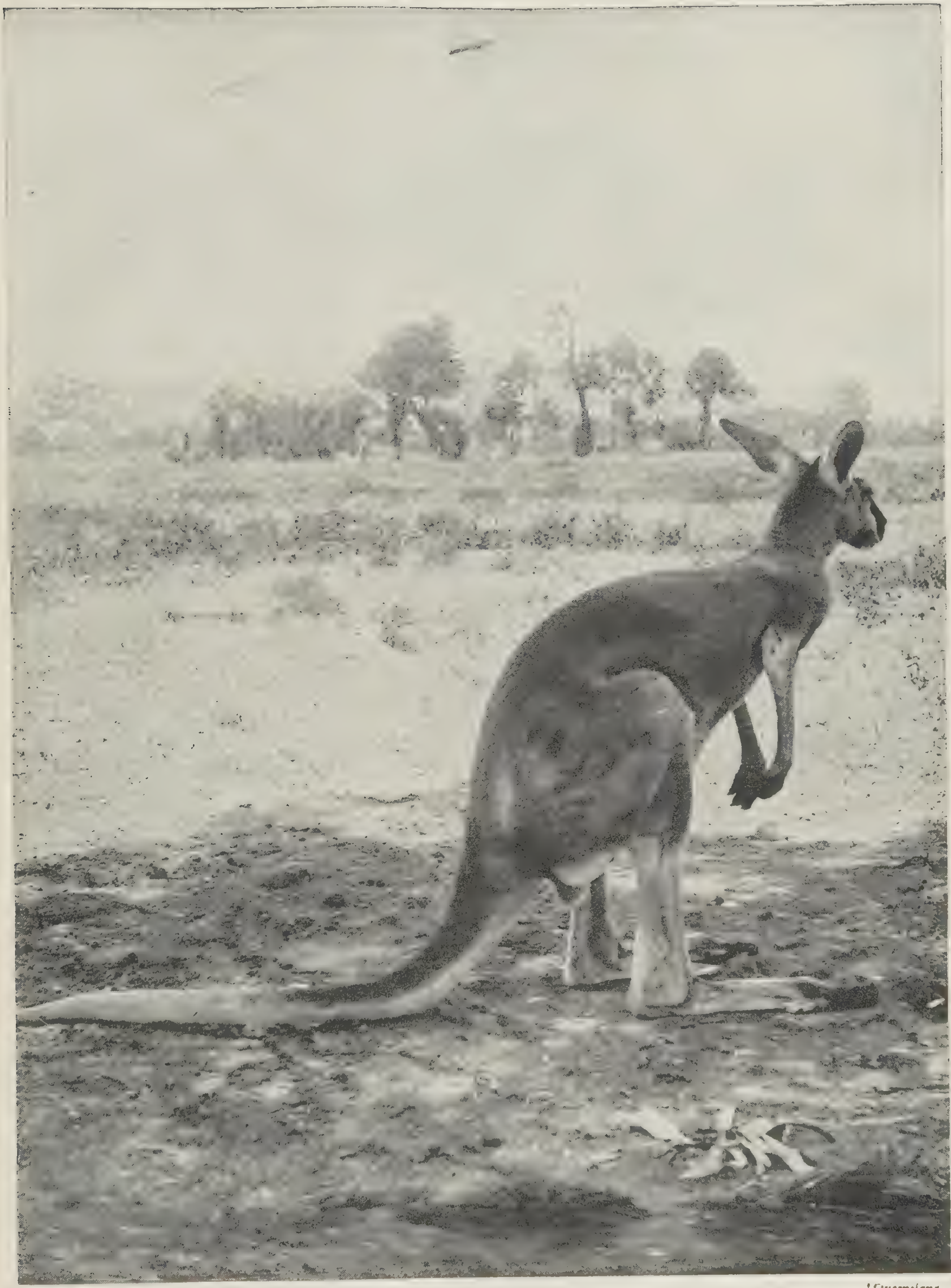


Photo by Billington] [*Queensland*

THE GREAT GREY KANGAROO

The massive hind limbs and tail of the animal constitute, in its characteristic resting pose, a most efficient supporting tripod

CHAPTER XXII

MARSUPIALS AND MONOTREMES

BY W. SAVILLE-KENT, F.L.S., F.Z.S.

MARSUPIALS

WITH the order of the Pouched Mammals we arrive — with the exception of the Echidna and Platypus, next described — at the most simply organised representatives of the Mammalian Class. In the two forms above named, egg-production, after the manner of birds and reptiles, constitutes the only method of propagation. Although among marsupials so rudimentary a method of reproduction is not met with, the young are brought into the world in a far more embryonic condition than occurs among any of the mammalian groups previously enumerated. There is, as a matter of fact, an entire absence of that vascular or blood connection betwixt the parent and young previous to birth, known as placentation, common to all the higher mammals, though certain of the more generalised forms have been recently found to possess a rudiment of such development. In correlation with their abnormally premature birth, it may be observed that a special provision commonly exists for the early nurture of the infant marsupials. In such a form as the Kangaroo, for example, the young one is placed, through the instrumentality of its parent's lips, in contact with the food-supplying teat, and to which for some considerable period it then becomes inseparably attached. Special muscles exist in connection with the parent's mammary glands for controlling the supply of milk to the young animal, while the respiratory organs of the little creature are temporarily modified in order to ensure unimpeded respiration. The fact of the young in their early life being commonly found thus inseparably adhering to the parent's nipple has given rise to the fallacious but still very widely prevalent idea among the Australian settlers that the embryo marsupial is ushered into the world as a direct outgrowth from the mammary region.

At the present day, with the exception of the small group of the American Opossums and the Selvas, the entire assemblage of marsupials, comprising some 36 genera and 150 species, are, singularly to relate, exclusively found in Australia, New Guinea, and the few neighbouring islands recognised by systematic zoologists as pertaining to the Australasian region. What is more, this region of Australasia produces, with some few insignificant exceptions, chiefly rodents, no other indigenous mammals.

It is interesting to note that within the limits of this isolated

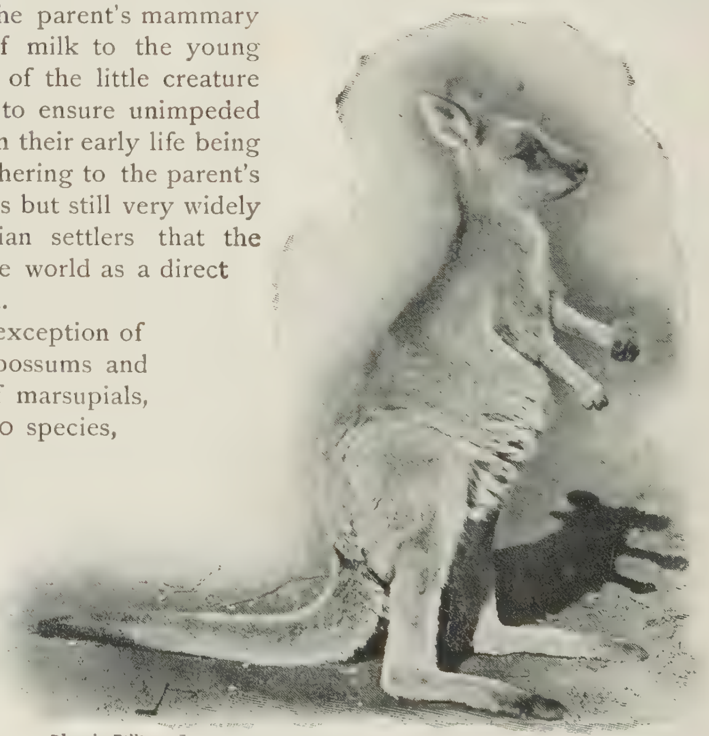


Photo by Billington] [*Queensland*

SILVER-GREY KANGAROO

In general form the kangaroos are so like one another that one figure would almost serve for all and anciently founded marsupial order we have an epitome, as it were, of many of the more important groups of an equivalent classificatory value that are included among the higher mammalia previously described. In this relationship we find in the so-called Tasmanian Wolf, the Tasmanian Devil, and the "Native Cats" carnivorous and eminently predatory forms whose habits and general conformation are immediately comparable to those of the typical Carnivora. The Bandicoots, Banded Ant-eater, and Phascogales recall in a similar manner the higher Insectivora. In the tree-frequenting Opossums and Phalangers the external likeness and conformity in habits to the arboreal rodents is notably apparent, several of the species, moreover, possessing a parachute-like flying-membrane essentially identical with that which is found in the typical Flying-squirrels. An example in which the ground-frequenting or burrowing rodents are closely approached is furnished by the Australian Wombat, an animal which may be appropriately likened to an overgrown and lethargic Marmot. In this form, moreover, the rodent-like character of the dentition is especially noteworthy. The higher grass-eating mammals find their counterparts in the family group of the Kangaroos, in which, in addition to their essentially herbivorous habits, the contour of the head and neck, together with the expressive eyes and large expanding ears, are wonderfully suggestive of the various members of the Deer Family. The Cuscuses of New Guinea and the adjacent islands, both in form and habits, somewhat resemble their geographical neighbours, the Lorises, belonging to the Lemur Tribe, compared with which higher mammals, however, they possess the advantage of an eminently serviceable prehensile tail. The Australian

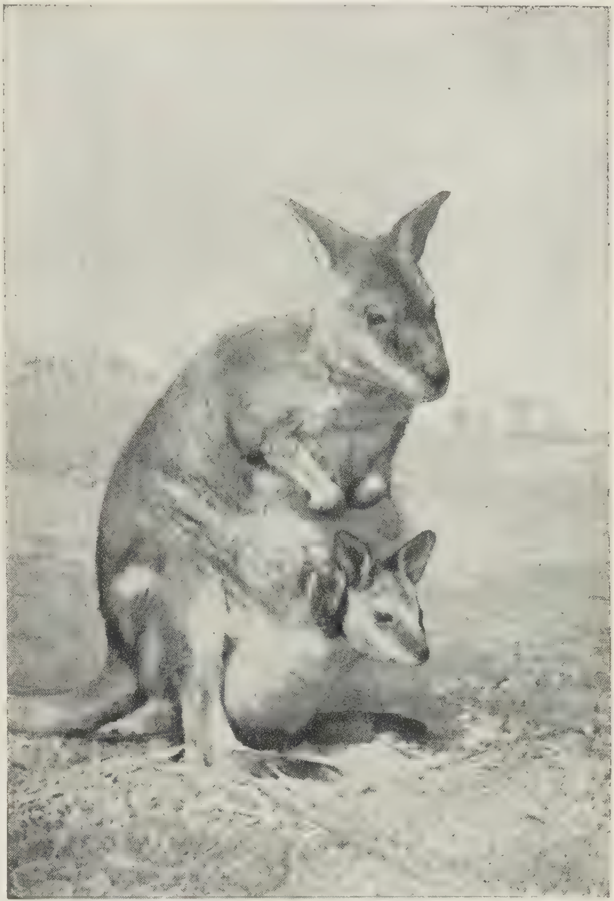


Photo by E. Landor] [*Ealing*

BLACK-STRIPED WALLABY

Female with half-grown young in her pouch

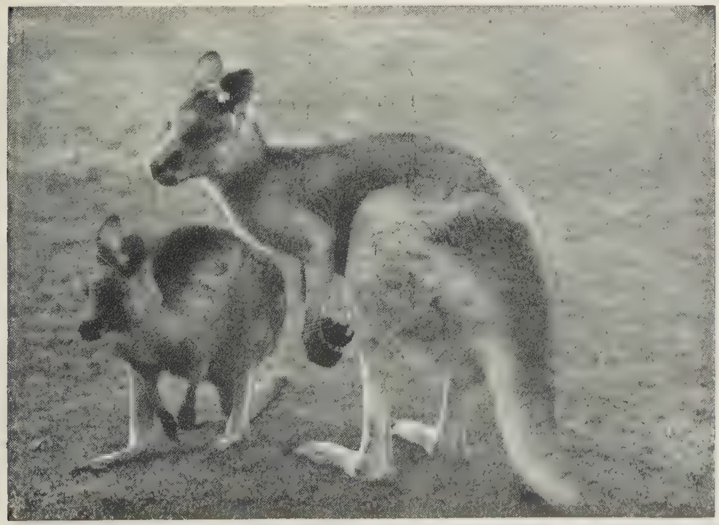


Photo by J. T. Newman] [*Berkhamsted*

BENNETT'S WALLABY AND THE GREAT GREY KANGAROO

This photograph illustrates the relative sizes of these two specie

Photo by D. Le Souef] [Melbourne

ALBINO RED KANGAROOS

Albino kangaroos and other Australian animals have been observed to be the product of special, narrowly limited locations

Koala, or so-called "Native Bear," has been commonly compared by zoologists with the Edentate Sloths; while in the most recently discovered marsupial, the Pouched Mole, we have a counterpart, in both form and habits, of the familiar European species. Finally, in the small American section of the Marsupialia, we meet with a type — the so-called Yapock, or Water-opossum — in which the resemblances to an Otter, in both aspect and its aquatic habits, are so marked that the animal was originally regarded as a species only of the Otter Tribe.

The character of the *marsupium*, or pouch, differs materially among the various members of their order. It presents its most conspicuous and normal development in such animals as the Kangaroos, Wallabies, and the Australian Opossums or Phalangers. In the Tasmanian Wolf and the Bandicoots the pouch opens backwards. In such forms as the Phascogale, or Pouched Mouse, the pouch is reduced to a few rudimentary skin-folds, while in the Banded Anteater its position is occupied by a mere patch of longer hairs, to which the helpless young ones cling. On the same *lucus a non lucendo* principle there is no trace of a pouch in the Koala, nor in those smaller species of the American Opossums which habitually carry their young upon their back. Even in these pouchless marsupials, however, the peculiar marsupial bones are invariably present, and in all other essential details their accord with the marsupial type of organisation and development is fully maintained.

THE KANGAROOS

The typical and most familiar member of the Marsupial Order is the KANGAROO — the heraldic mammal of that vast island-continent in the South Seas, whose phenomenal advance by leaps and bounds, from what scarcely a century since was represented by but a few isolated settlements, has been aptly likened to the characteristic progression of this animal. Of kangaroos proper there are some twenty-four known species distributed throughout the length and breadth of Australia, extending southwards to Tasmania, and to the north as far as New Guinea and a few other adjacent islands.

In point of size the GREAT GREY KANGAROO and the RED or WOOLLY species run each other very closely. A full-grown male of either species will weigh as much as 200 lbs., and measure a little over 5 feet from the tip of the nose to the base of the tail, this latter important member monopolising another 4 or 4½ feet. The red or woolly species more especially affects the rocky districts of South and East Australia, while the great grey kind is essentially a plain-dweller and widely distributed throughout the grassy plains of the entire Australian Continent and also Tasmania. It is to the big males of this species that the titles of "Boomer," "Forester," and "Old Man Kangaroos" are commonly applied by the settlers, and the species with which the popular and exciting sport of a kangaroo hunt — the Antipodean substitute for fox-hunting — is associated. The pace and staying power of an old man kangaroo are something phenomenal. Fox-hounds would have no chance with it; consequently a breed of rough-haired greyhounds, known as kangaroo-dogs, are specially trained for this sport.

A run of eighteen miles, with a swim of two in the sea at the finish, and all within the space of two brief crowded hours, is one of the interesting records chronicled. The quarry, when brought to bay, is, moreover, a by no means despicable foe. Erect on its haunches, with its back against a tree, the dogs approach it at their peril, as, with a stroke of its powerful spur-armed hind foot, it will with facility disembowel or otherwise fatally maim its assailant. Another favourite refuge of the hunted "boomer" is a shallow water-hole, wherein, wading waist-deep, it calmly awaits its pursuers' onslaught. On the dogs swimming out to the attack, it will seize them with its hand-like fore paws, thrust them under water, and, if their rescue is not speedily effected, literally drown them. Even man, without the aid of firearms, is liable to be worsted in an encounter under these conditions, as is evidenced in the following anecdote.

A newly arrived settler from the old country, or more precisely from the sister island, ignorant of the strength and prowess of the wily marsupial, essayed his maiden kangaroo hunt with only a single dog as company. A fine grey boomer was in due course started, and after an exciting chase was cornered in a water-hole. The dog, rushing after it, was promptly seized and ducked; and Pat, irate at the threatened drowning of his companion, fired, but missed his quarry, and thereupon jumped into the water-hole, with the intention, as he afterwards avowed, "to bate the brains out of the baste" with the butt-end of his gun. The kangaroo, however, very soon turned the tables upon Pat. Before he had time to realise the seriousness of the situation he found himself lifted off his feet, and soused and hustled with such vigour that both Pat and his dog most narrowly escaped a watery grave. A couple of neighbours, by good luck passing that way, observed the turmoil, and came to the rescue

Photo by W. Reid

TASMANIAN WALLABY

Has softer and thicker fur than its relative of the Australian mainland

Between them they beat off and killed the kangaroo, and dragged Pat to land in a half-drowned and almost insensible condition. Pat recovered, and vowed "niver to meddle with such big bastes" again.

The doe kangaroos, while of smaller size and possessing much less staying power than their mates, can nevertheless afford a good run for horses and dogs, and are commonly known as "flyers." When carrying a youngster, or "Joey," in her pouch, and hard pressed by the dogs, it is a common thing for the parent to abstract her offspring from the pouch with her fore paws, and to throw it aside into the bush. The instinct of self-preservation only, by the discharge of hampering impedimenta, is usually ascribed to this act; but it is an open question whether the maternal one of securing a chance of escape for her young, while feeling powerless to accomplish it for herself, does not more often represent the actual condition of the case.

In proportion to the size of its body the kangaroo yields but a limited amount of meat that is esteemed for food. The tail represents the most highly appreciated portion, since from it can be compounded a soup not only equal to ordinary ox-tail, but by gourmands considered so superior that its conservation and export have proved a successful trade enterprise. The loins also are much esteemed for the table, but the hind limbs are hard and coarse, and only appreciated by the native when rations are abnormally short. "Steamer," composed of kangaroo-flesh mixed with slices of ham, represented a standing and very popular dish with the earlier Australian settlers; but with the rapid disappearance of the animal before the advance of colonisation this one time common concoction possesses at the present day a greater traditional than actual reputation.

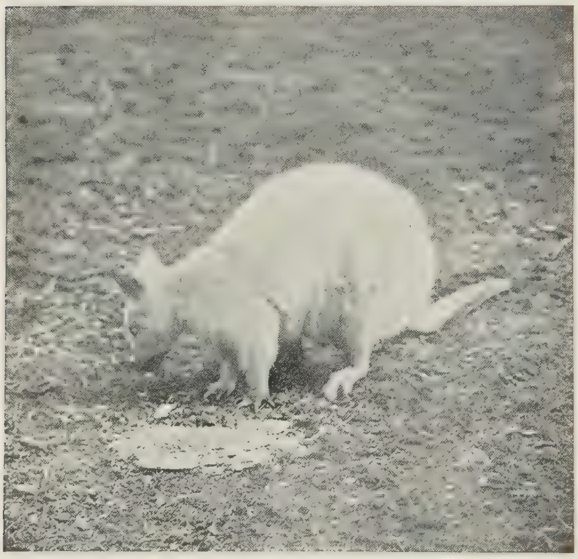


Photo by D. Le Souef [*Melbourne*

ALBINO RED-BELLIED WALLABY

Many of the Marsupials, including Kangaroos and the Opposum-like Phalangers, exhibit a tendency to albinism

The hunting of the kangaroo is conducted on several distinct lines, the method of its pursuit being varied, according to whether the animal is required for the primary object of food, for the commercial value of its skin, as a matter of pure sport, or to accomplish its wholesale destruction in consequence of its encroachments on the pasturage required for sheep- and cattle-grazing.

The greatest measure of healthy excitement in hunting the kangaroo, from the standpoint of pure sport, is no doubt to be obtained when running the marsupial down with horse and hounds in congenial company, as referred to on a previous page. The stalking of the animal single-handed on horseback or on foot, much after the manner of the deer, has also its enthusiastic votaries, and calls into play the greatest amount of patience and *savoir-faire* on the part of the sportsman. It has been affirmed by a Queensland writer, "To kill kangaroos with a stalking-horse requires the practice of a lifetime, and few 'new chums' have the patience to learn it. It is, in fact, only stockmen, black-fellows, and natives of the bush who can by this method expect to make kangaroo-shooting pay." The horse which is successfully employed by experienced bushmen for stalking purposes is specially trained to its work, and, walking apparently unconcernedly in the direction of the selected quarry, brings the gunners, if they are experts in the art of keeping themselves well concealed, within easy range. In this manner two or three kangaroos are not infrequently shot in the same stalk, the animals having a tendency, on hearing the report of the gun, but not locating the direction from which

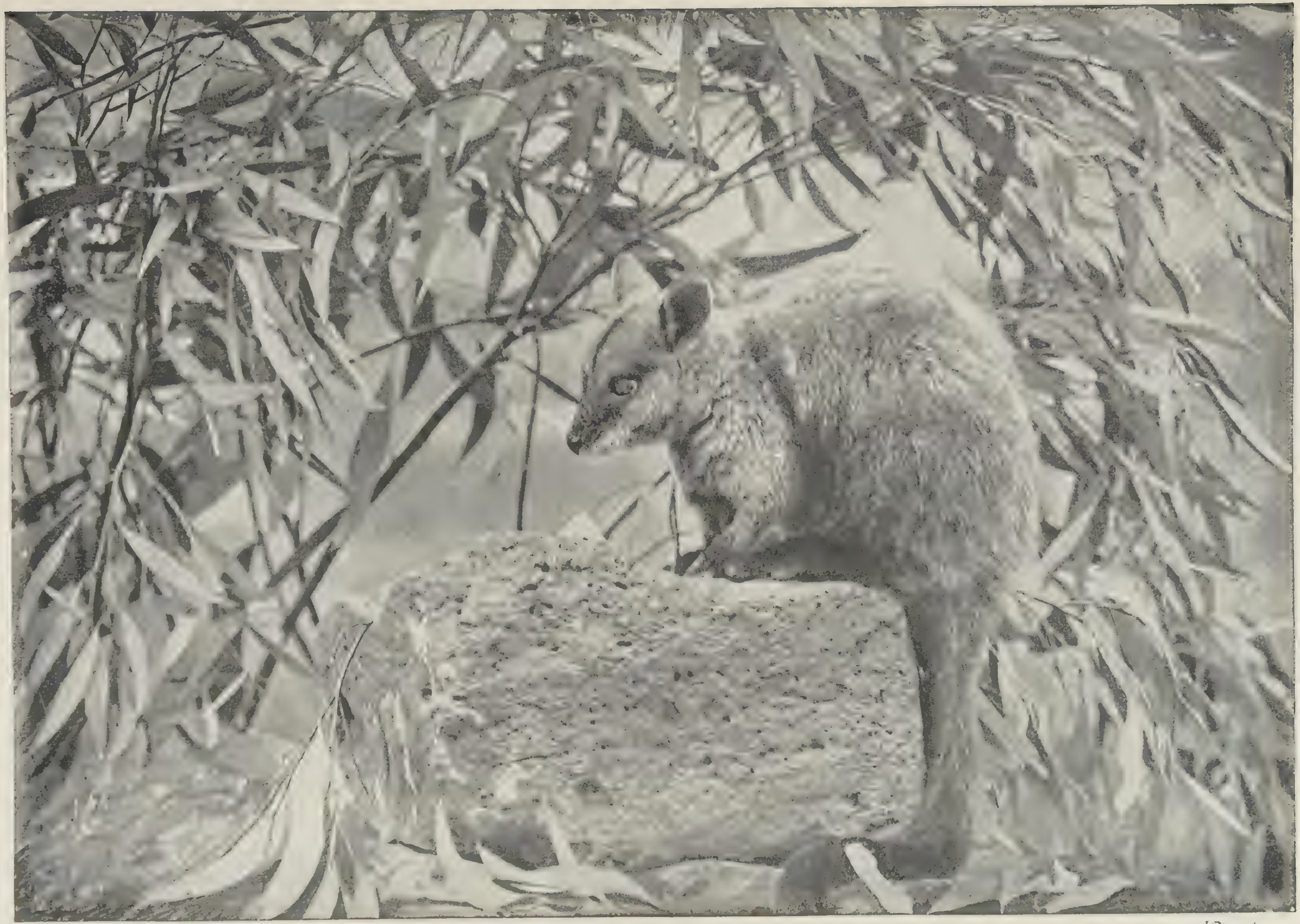


Photo by Billington] [Queenslan.

ROCK-WALLABY

The Rock-Wallabies, in contradistinction to the Kangaroos, are for the most part nocturnal in their habits

Photo by D. Le Souef] [*Melbourne*

PARRY'S WALLABY

In attitude of listening

it was discharged, to rush about in an aimless manner, and, as frequently happens, in the immediate direction of the hidden sportsman. In the good old times it is recorded that an experienced hand might kill as many as seventy or eighty kangaroos in a day by this stalking method. The marsupials are at the present date, however, so severely decimated that even in the most favourable settled districts a bag of from twelve to twenty head must be regarded as exceptional. Stalking the kangaroo on foot without the horse's aid is more strongly recommended to those to whom an occasional shot is considered sufficiently remunerative. Taking full advantage of intervening bushes and other indigenous cover, an approach to within a hundred yards or so of the quarry may be usually accomplished, though not quite so easily, perhaps, as might be at first anticipated. It is the habit of the kangaroo to sit up waist-high in the midst of the sun-bleached grass, which corresponds so closely in colour with its own hide that unless the animal is silhouetted against the sky-line it readily escapes detection.

The conditions under which the kangaroo is obtained for the main purpose of supplying the human commissariat is perhaps most aptly illustrated in connection with its chase as prosecuted by the Australian aborigines. In Tasmania and the Southern Australian States the primeval man is either extinct or more rare than the kangaroo. In the extreme north and far north-west, however, he still poses as "the lord of creation," and conducts his hunting expeditions on a lordly scale. The food-supply of the Australian native is essentially precarious. Long intervals of "short commons" are interspersed with brief periods of over-abundance, in which he indulges his appetite to its fullest bent. A kangaroo drive on native lines represents to the Australian mind one of these

Photo by D. Le Souef] [*Melbourne*

PARRY'S WALLABY

Characteristic feeding attitude

last-named superlatively memorable occasions. The entire tribe, men, women, and all capable youths, participate in the sport. Fires are lit by one section of the tribe, according to the direction of the wind, encircling a vast area of the country, while the other section posts itself in detachments in advantageous positions to intercept the terrified marsupials as they fly in the presumed direction of safety to escape the devouring element. Spears and waddies and boomerangs, in the hands of the expert natives, speedily accomplish a scene of carnage, and the after feast that follows may perhaps be best left to the imagination of the reader. The encroachments of neighbouring natives on the happy hunting-grounds that time and custom have conceded to be the sole monopoly of any one particular tribe is most strenuously resented, and constitute one of the commonest sources of their well-nigh perpetual inter-tribal battles.

A kangaroo battue, as carried into practice by European settlers in those few remaining districts where the animal is sufficiently abundant to constitute a pest by its wholesale consumption of the much-prized pasturage, is far more deadly in its results to the unfortunate marsupials. Existing sheep-fences, supplemented by a large suitably enclosed yard, are first specially prepared for the reception of the expected victims. All the settlers, stockmen, and farm hands from the country round are pressed into service, and assemble on horseback or on foot at the appointed rendezvous at break of day. A widely spreading cordon of beaters being told off, a systematic drive is then commenced, which results in all the animals being driven towards and collected within the enclosed yard. The culminating scene is one of wholesale slaughter with club and gun. From these battues none of the unfortunate animals escape, as they are so closely hemmed in.

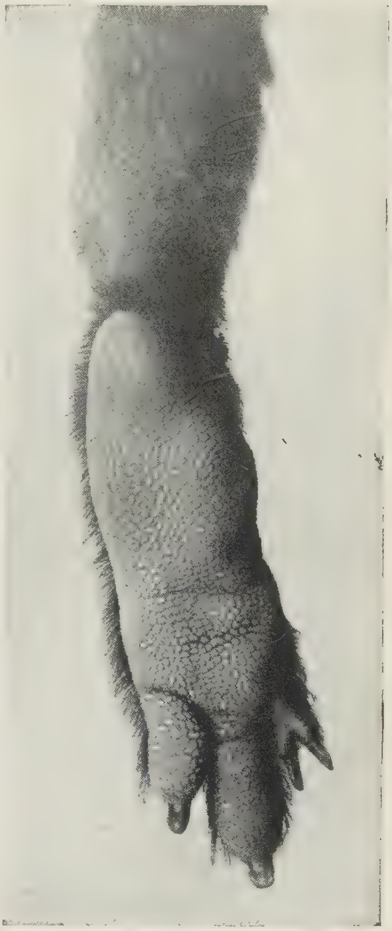


Photo by D. Le Souef, Melbourne

FOOT OF TREE-KANGAROO

Underside, showing peculiar skin-corrugations and the united second and third toes

The first record of the existence of the kangaroo, coupled with its characteristic name, is found associated, it is interesting to observe, with the history of one of the earlier voyages of Captain Cook. The neighbourhood of Cooktown, in Queensland, claims the honour of supplying the first example of the animal which was brought to Europe and astonished the zoologists of that time by the singularity of its form and reported habits. Captain Cook happened — in July, 1770 — to be laying up his ship, the *Endeavour*, for repairs, after narrowly escaping total wreck on the neighbouring Great Barrier Reef, in the estuary of the river subsequently coupled with his ship's name. Foraging parties, dispatched with the object of securing, if possible, fresh meat or game for the replenishment of the ship's well-nigh exhausted larder, returned with reports of a strange creature, of which they subsequently secured specimens. Skins were preserved and brought to England, but it was some little time before the zoological position and affinities of the creature were correctly allocated. By some naturalists it was regarded as representing a huge species of Jerboa, its near relationship to the previously known American Opossums being, however, eventually substantiated. The closer acquaintanceship with the peculiar fauna of Australia that followed upon Captain Cook's memorable voyage of discovery along the coast-line of that island-continent soon familiarised naturalists with many other of the allied species of which the kangaroo constitutes the leading representative.

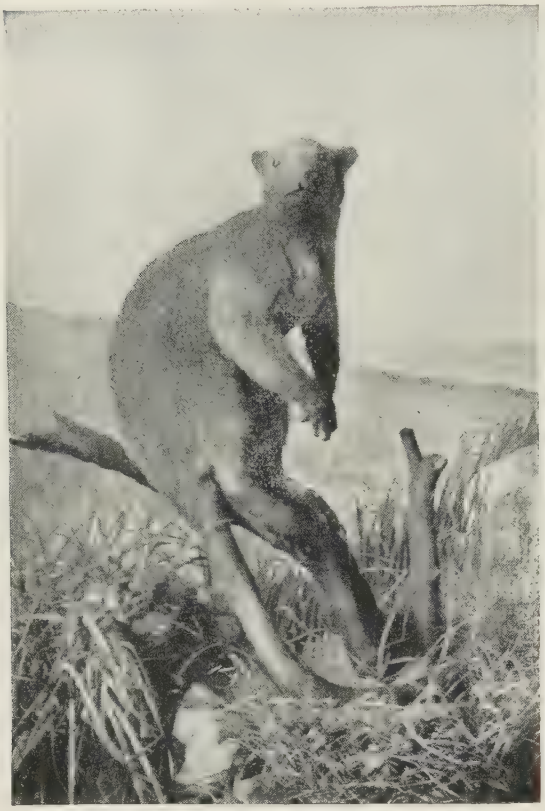


Photo by W. Saville-Kent, F.Z.S.

BROWN TREE-KANGAROO

This species represents the group in North Queensland

Some considerable amount of obscurity is associated with the prime origin of the animal's almost world-wide title of "Kangaroo." It is most commonly accepted as representing the native name for the creature in that Queensland district from whence it was first reported by Captain Cook. No later investigations and enquiries have, however, in any way established the correctness of this hypothesis, those explorers who have made a special study of the dialects and habits of the aboriginal inhabitants entirely failing to elicit anything even remotely coinciding with the name in question. It has, in fact, been reluctantly concluded by one of the most experienced Queensland authorities on these matters that the name originated as a mere miscomprehension of the information elicited from the natives. Verbal communication with the native tribes under the most favourable circumstances is liable to a vast amount of misunderstanding, and where other than linguistic experts are present it frequently happens that much mongrel or "pidgin English" gets mixed up with the native terms. Assuming this to have been the case in the present instance, it has been suggested that the name of Kangaroo, or "Kanguroo," as it was originally spelt, implied some form of negation of the knowledge which the enquiring white man was seeking to elicit, or, maybe, partly even a phonetic and parrot-like repetition of the constantly recurring query that was doubtless current among the "handy men" of the *Endeavour's* commission, such as "Can you" tell me this or that concerning the many unfamiliar objects that greeted the eyes of the new arrivals in this strange land. The writer retains a vivid recollection of a closely analogous manner in which the rural inhabitants of Vigo Bay, on the Spanish coast, appropriated a common phrase used by the crew of the yacht with whom he landed there. Having evidently noted that the two words "I say" prefaced the majority of Jack-tar's speeches, this catch-phrase was adopted and applied by them as a greeting and as a reply to almost every interrogation in dumb-show or otherwise that was addressed to them. An unknown animal submitted to these rustic Solons would doubtless have been dubbed the "I say"; and had the land been a new one — say, somewhere in the South Seas — that name would probably have stuck to it. Applying this interpretation to the kangaroo, and bearing in mind the fondness of the Australian native to duplicate his name-words or syllables — e. g. *wagga-wagga*, *debil-debil*, and so forth — the "Kang-you-you" or a closely resembling phonetic expression would present itself to the native mind as a much more correct rendering of the simpler "Can you" or "Kang you" which he had picked up as a catch-phrase from the *Endeavour's* crew. In the absence, at all events, of any more rational interpretation of the mystery, this one would seem to merit consideration.

While the kangaroo is being speedily dethroned from the dominant position it originally occupied in the indigenous Australian fauna, praiseworthy and highly successful attempts have been made to acclimatise this marsupial in one of the English Parks, Woburn Abbey, and elsewhere, where troops of these graceful creatures may be seen under conditions of happiness and liberty scarcely inferior to those by which they are environed in their native "bush."

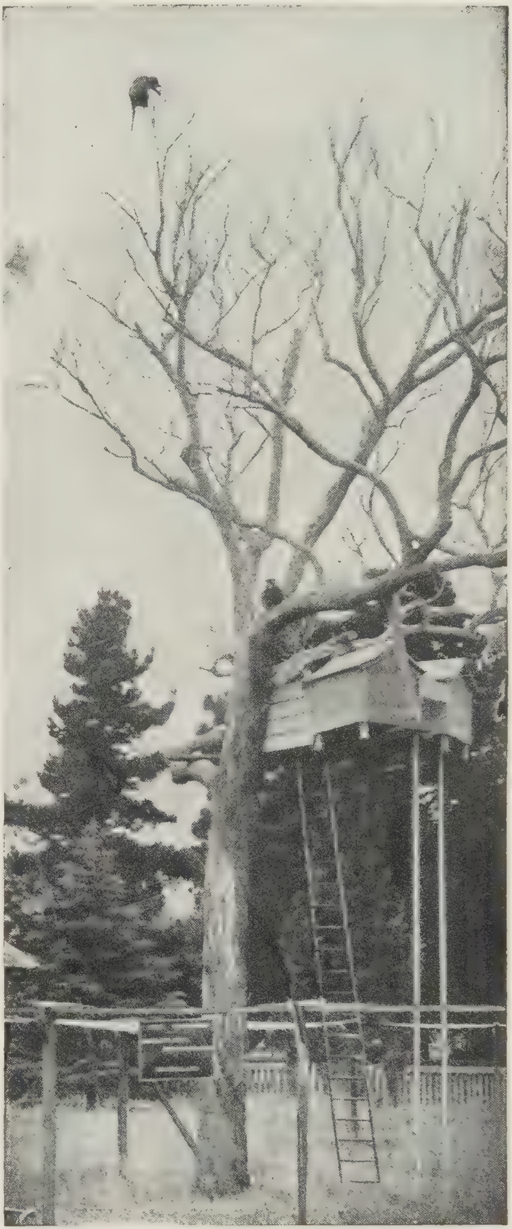


Photo by D. Le Souef] [*Melbourne*

TREE-KANGAROOS

Examples acclimatised in the Melbourne Zoological Gardens

Of smaller members of the Kangaroo Family, there are some thirty distinct forms, popularly known in Australia as WALLABIES, WALLAROOS, PADDY-MELONS, POTOROOS, KANGAROO-HARES, KANGAROO-RATS, etc. The wallabies, which represent the most important group with regard to their larger size and economic utility, number some fourteen or fifteen species, and are distinguished, with relation more especially to their habitats or peculiar structure, as ROCK-, BRUSH-TAIL, and SPUR-TAIL WALLABIES, etc. Among the rock-wallabies the yellow footed species from South Australia is undoubtedly one of the handsomest as well as the largest member of its group, the uniform grey characteristic of the majority of its members being in this instance represented by an elegantly striped and banded form, in which the several tints of brown, yellow, black, and white are pleasingly interblended. The successful stalking of rock-wallabies in their native fastnesses entails no mean amount of patience and agility. Although these animals are so abundant in favoured localities as to make hard-beaten tracks to and fro betwixt their rock-dwellings and their pasture-grounds, one may traverse the country in broad daylight without catching a glimpse of a single individual. One species, about the size of a large rabbit, is very plentiful among the rocky bastion-like hills that border the Ord River, which flows into Cambridge Gulf, in Western Australia. Efforts to stalk examples in broad daylight proved fruitless; but by sallying out a little before daybreak, so as to arrive at their feeding-grounds while the light was still dim, the writer succeeded in securing several specimens. Many of these rock-wallabies are notable for the length, fine texture, and pleasing tints of their fur, their skins on such account being highly esteemed for the composition of carriage-rugs and other furry articles.

Of the larger brush or scrub varieties, the species known as the BLACK WALLABY is the most familiar form. It is particularly abundant in the Southern Australian States, and also in Tasmania. Its flesh is excellent eating, and, dressed and served up in the orthodox manner of jugged hare, can scarcely be distinguished from that toothsome dish. Some of the smaller species, such as the hare- and rat-kangaroos or potoroos, are, as their names denote, of no larger dimensions than the familiar rodents from which they are popularly named. Several of these smaller species, including notably the potoroo, or kangaroo-rat of New South Wales, are addicted to paying marked attention to the settlers' gardens, and, being to a large extent root-feeders, have acquired a special predi

Photo by York & Son] [*Notting Hill*

GAIMARD'S RAT-KANGAROO

A species named after the French naturalist, Gaimard

lection for the newly planted or more fully matured potato crops.

The most abnormal group of the Kangaroo Family is undoubtedly that of the TREE-KANGAROOS, formerly supposed to have been limited in its distribution to the island of New Guinea, but which has within recent years been found to be represented by one or more species in Northern Queensland. At the Melbourne Zoo they have been found, except in the coldest weather, to thrive well in the open — a moderate-sized tree, with a small fenced-in enclosure around it, being admirably suited to their requirements, at the same time providing a most instructive exhibition of their peculiar forms and idiosyncrasies. Seen at its best, however, the tree-kangaroo, or "boongarry," as it is known amongst the Queensland natives, is a most clumsy, melancholy-looking beast, which has apparently found itself "up a tree," not as the outcome of its personal predilections, but owing to the *force majeure* of untoward pressure in the form either of relentlessly persecuting enemies or the failure of its normal terrestrial commissariat. Compared with the graceful and superlatively agile tree-frequenting phalangers, between whom and the ordinary kangaroos it has been sometimes, but erroneously, regarded as representing a connecting-link, the boongarry presents a most ungainly contrast. Its climbing powers are of the slowest and most awkward description, the whole of its energies being concentrated on its endeavour to preserve its balance and to retain a tight hold upon the branches of the trees it frequents, and to which it clings with such tenacity with its long sharp claws that it can with difficulty be detached. In its wild state, moreover, these claws can be very effectively used as weapons of defence; and hence the natives, with whom the animal is highly esteemed as an article of food, are careful to give it its quietus with their clubs or waddies before venturing to handle it. The tree-kangaroos inhabit the densest parts of the forests or "scrubs" of New Guinea and tropical Queensland, and appear to confine their movements chiefly to the trees of moderate size, or the lower branches only of the taller ones.

The species which constitutes the most natural known connecting-link between the typical Kangaroos and the family of the Phalangers, next described, is the FIVE-TOED RAT-KANGAROO, or POTOROO. As its name implies, it is a small creature of rat-like aspect and dimensions, and possesses, like a rat, a long, cylindrical, naked, scaly tail. It is the structure of the feet, however, that constitutes the important distinction. In place of the four toes only to the hind limbs it possesses the full complement of five, and the first toe, moreover, is set farther back, and is opposable for grasping purposes. This animal is from Queensland.

Photo by W. Saville-Kent, F.Z.S.

RAT-KANGAROO FROM NEW SOUTH WALES

One of the small jerboa-like species

THE PHALANGERS

The Phalanger Family of Marsupials, which next invites attention, is constituted of animals especially adapted to lead an arboreal life, though among themselves they exhibit very considerable structural variations. The species usually placed at the head of this group is the essentially droll and in many respects abnormal form known as the KOALA, or AUSTRALIAN NATIVE BEAR. Its little podgy tailless body, short thick-set head, and round tufted ears lend some countenance perhaps to the ursine analogy; but there the likeness ends.

The koala is limited in its distribution to the south-eastern region of the Australian Continent, and is there found inhabiting the loftiest gum-trees, on the leaves and flowers of which it almost exclusively feeds. Compared with the opossum and squirrel-like phalangers, the koala is a very slow and sedentary little animal, remaining stationary in and browsing upon the leaves of the same gum-tree for days or even weeks at a stretch. Taking advantage of this home-staying propensity, examples are established, with full liberty to wander at will among the large gum trees, in the Melbourne Zoological Gardens, and have never abused the confidence reposed in them by surreptitiously absconding. The young koalas in particular make the most droll and delightful of household pets, speedily becoming attached to and following their owners about the premises, or contentedly settling down to the possession of an allotted corner of the verandah, in which an improvised perch has been erected and a constant supply of its favourite gum-leaves is daily assured. One such example, kept in Brisbane, Queensland, furnished the writer with the material for the photograph on this page; also of another one that illustrated in an interesting manner the very singular attitude assumed by the animal when asleep. Instead of creeping into the hollow trunk or spout of a gum or other tree, as the opossums and other phalangers are wont to do, the little "bear" simply sticks tight to his supporting branch, and, tucking in his head and ears and limbs, converts himself into an apparently homogeneous rounded mass of fur or moss, and, thus disguised, peacefully sleeps. Seen at some little distance, in fact, none but a trained eye could distinguish this sleeping bear from one of the round woody excrescences or bunches of mistletoe-like parasitic growths that are of common occurrence on the trees in every gum forest. In this way the little creature secures immunity from the

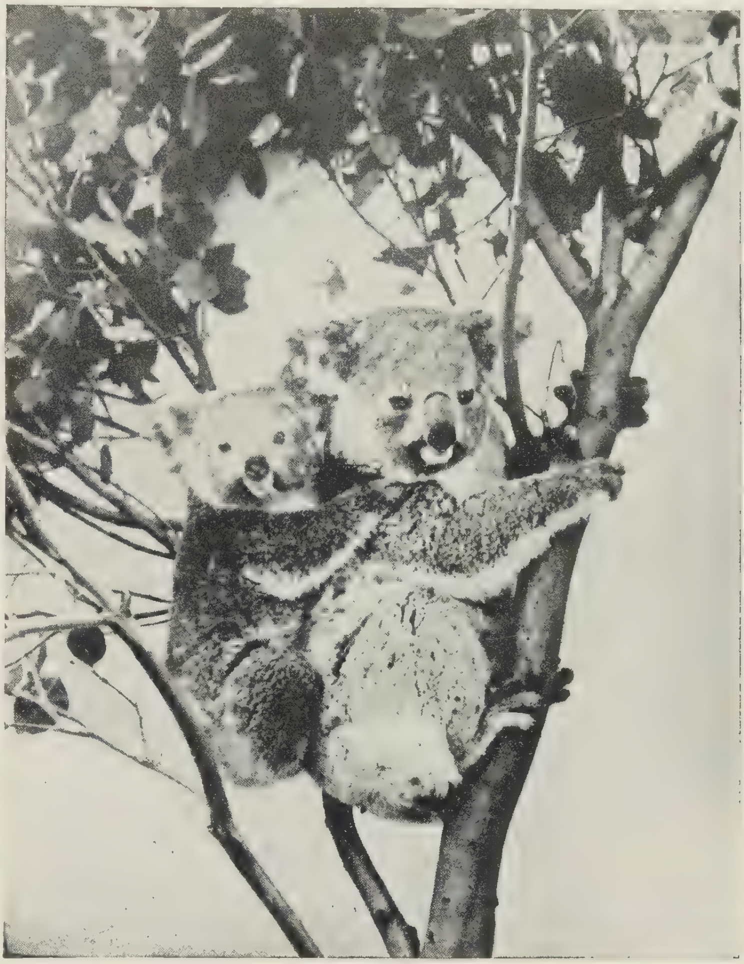


Photo by W. Saville-Kent, F.Z.S.

KOALA, OR AUSTRALIAN NATIVE BEAR AND CUB

An excellent illustration of the way in which the female koalas carry their young securely perched on their backs

Photo by W. Saville-Kent, F.Z.S.

KOALA, OR AUSTRALIAN NATIVE BEAR

The koala has no tail, and is a stout, clumsily built animal, about 32 inches in length, with thick woolly fur of a greyish colour

attacks of enemies by mimicking the characteristic peculiarities of its environment, as obtains so generally among insects and other of the lower orders of animated nature. A closely analogous sleeping attitude, it may be mentioned, is assumed by one of the African lemurs or pottos, which have been dealt with in a previous chapter.

Although in captivity the koala takes kindly to a mixed diet in which bread-and-milk and fruit may form substantial elements, it can rarely be induced to altogether dispense with its customary gum-leaf regimen, and it is this circumstance that mainly accounts for its rarity in European menageries. Time and again, however, this interesting animal has put in an appearance at the Regent's Park; but in spite of Kew Gardens and other sources being laid under contribution for a supply of gum-tree leaves, its sojourn there has been but brief. As a matter of fact, the common or blue gum-tree, which is alone cultivated and available in any quantity in this country, and which is indigenous to Tasmania, is not the species on which the koala is accustomed to feed. Of gum-trees there are some hundred species, every one differing in the peculiarity of its aromatic scent and flavour, and having its special clientèle among the ranks of leaf-browsing animals. So far as the writer's observations extended, it was the big Queensland "white" and "swamp" gums that were especially patronised by the Australian bears, and these are not grown in England.

Although at first sight, and normally so far as the younger individuals are concerned, the koala would appear to represent the most perfect embodiment of peace and goodwill among mammals, he is accredited at a maturer age, when crossed in love or goaded to resentment by some other cause, to give way to fits of ungovernable rage. These temporary lapses are, however, very transient, and our little friend soon recovers his customary bland placidity. While it is being threshed out, nevertheless, the "burden of song" delivered by rival claimants for a partner's favours is a remarkable phenomenon. The circumstance that the vocal duet is commonly executed high up among the branches of the loftiest gums no doubt adds very considerably to both the timbre of the "music" and the distance to which it is carried. The old-time phrase of "making the welkin ring" would undoubtedly have been applied with alacrity and singular appropriateness by the poets of the departed century to the love-song of the koala, had they been privileged to hear it.

Among the examples of the koala which have been in residence at the Zoo, one of them came to a pathetic end. As told to the writer by Mr. A. D. Bartlett, the late superintendent, it appears that the little animal, on exhibition in the gardens during the day, was brought into the house at night, and allowed the run of a room which, among other furniture, included a large swing looking-glass. One morning the little creature was found crushed to death beneath the mirror, upon which it had apparently climbed and over balanced. The information that the animal was a female evoked the suspicion that personal vanity and

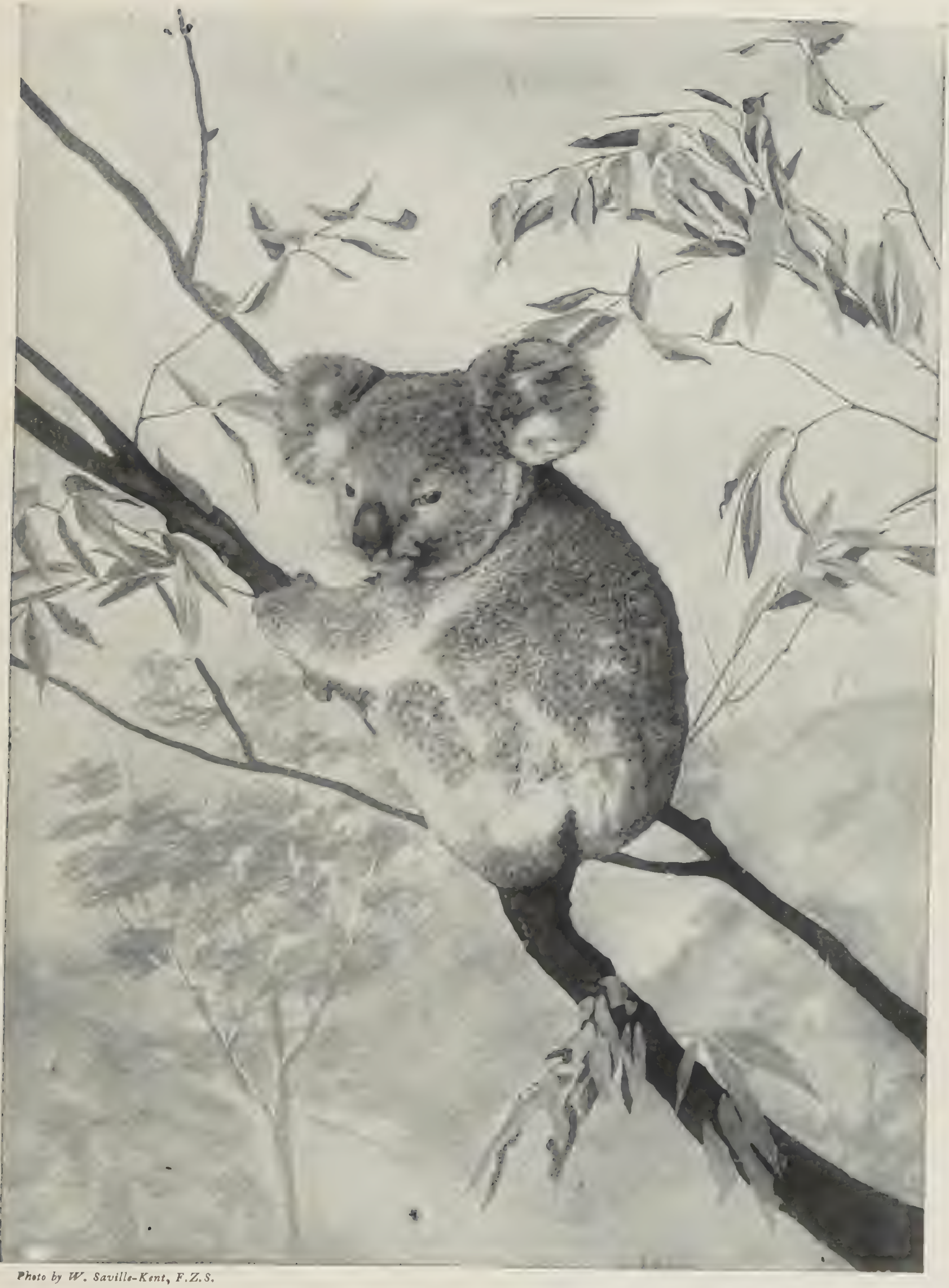


Photo by W. Saville-Kent, F.Z.S.

KOALA, OR AUSTRALIAN NATIVE BEAR

These animals make a peculiarly plaintive cry when molested in any way by human beings the admiration of its own image in the glass had some share in compassing its untimely end. Possibly, however, it hailed in the reflection the welcome advent of a companion to share its lone banishment from the land of the gum-tree, and in its efforts to greet it thus came to grief.

The female koala produces but one cub at a time. At an early period after its birth this is transferred to its mother's back, and is thus transported until its dimensions are about one-half of those of its parent. The pair as shown in the illustration on page 355 presents, under these conditions, an essentially grotesque aspect.

It is a noteworthy circumstance that, compared with the male, the female koala is but rarely to be observed wandering abroad during broad daylight. As with the typical phalangers food is consumed chiefly at night or during the brief Australian twilight hours. While the male at certain periods, more especially the months of March and April, is much in evidence in daytime to both the senses of sight and hearing, as attested to on a previous page, the female spends the whole or greater portion of the day clinging as an inert sleeping mass to a convenient branch. "Bear"-shooting in Australia, as might be anticipated from the description here given of the animal's habits and temperament, affords but sorry sport. It may further be remarked that those who have shot at and only disabled one of these inoffensive little creatures are scarcely likely to repeat the experiment. The cry of a wounded koala has been aptly compared to that of a distressed child, but still more pathetic. When fatally shot, it also more frequently than otherwise clings tenaciously back-downwards, like the South American sloths, to the supporting tree-branch, and is thus frequently irrecoverable. With the non-sentimental Australian furrier the koala's pelt of soft, crisp, ashy-grey fur is unfortunately in considerable demand, being made up mostly, with the quaint round head and tufted ears intact, into, it must be confessed, singularly attractive and warm rugs.

The correspondence of the koala in form and habits to the sloths among the higher mammalia has been previously mentioned. The parallelism might be pursued in yet another direction. In earlier times the small tree-inhabiting South American sloths were supplemented by ground-frequenting species, such as the Megatherium, which were of comparatively titanic proportions. The epoch of the accredited existence of these huge ground-sloths was so comparatively recent — the later tertiaries — that it is even yet not regarded as altogether improbable that some existing representative of the race may yet be discovered in the fastnesses of the South American forests, and thus claim a niche in the pages of a subsequent edition of "LIVING ANIMALS." In a like manner the little sloth-like tree-frequenting "Australian Bear" had his primeval ground-dwelling colossi, and there is yet a lurking hope among enthusiastic zoologists that some surviving scion of the little koala's doughty forebears may yet turn up in the practically unexplored Central Australian wildernesses. Some such anticipations, as a matter of fact, stimulated the hopes and aspirations of the participators in one of the latest of these exploring expeditions, which, while not successful in this instance in obtaining so great a prize, secured for science that most interesting and previously unknown marsupial mammal the Pouched Mole.

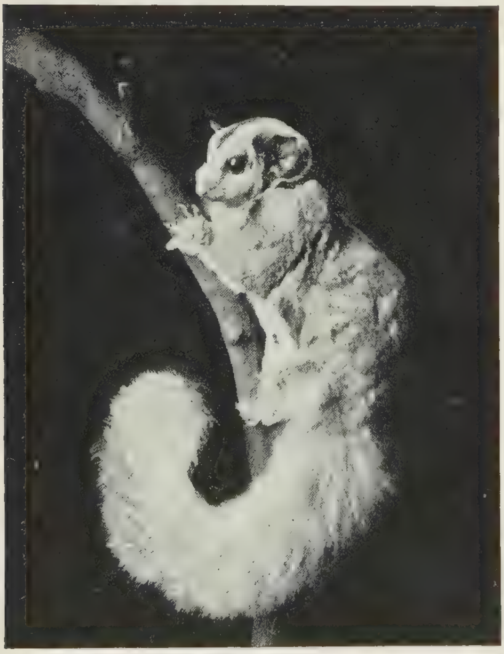


Photo by W. Saville-Kent, F.Z.S.

SQUIRREL-LIKE FLYING-PHALANGER OF VICTORIA

This animal has soft grey fur like that of the chinchilla

The Typical Phalangers

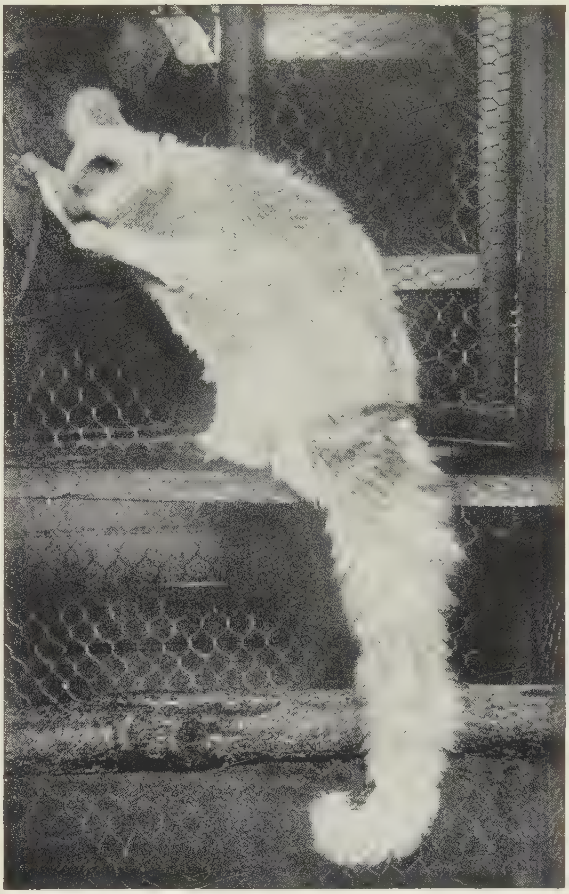


Photo by W. Saville-Kent, F.Z.S.

LARGER FLYING-PHALANGER

A nearly pure white example

The typical PHALANGERS, or OPOSSUMS, as they are familiarly known throughout Australia, include a very considerable number of representatives, ranging in size from that of a small mouse to that of a full-grown cat. All are essentially arboreal in their habits, feeding principally on the leaves and flowers of the various gums. They are for the most part strictly nocturnal in their habits, and make their homes and retiring-places during the day in the hollow trunks and limbs that are of such abundant occurrence in the periodically fire-swept Australian forests. Almost all the larger species are notable for the length, thickness, and exquisitely fine texture of their fur, a circumstance for which they are consequently laid under heavy penalties for the sake of their pelts. The island colony of Tasmania, in the extreme south, with its colder climate, as might be anticipated, produces the finest qualities of these furs, that of the BLACK or SOOTY OPOSSUM, which is peculiar to the island, being most highly prized. The length and furry character of their in many instances prehensile tails also form a conspicuous feature of this group. Nature, in fact, apparently distributed caudal material so over-liberally among these marsupials that the little koala had to make shift without.

The group of the Phalanger Family popularly known as FLYING-SQUIRRELS, or more correctly as FLYING-PHALANGERS, is almost universally admitted to include some of the most beautiful of living mammals. In external structure, so far as their peculiar so-called "flying" mechanism is concerned, these animals coincide in a remarkable manner with the true flying-squirrels, belonging to the Rodent Order, indigenous to the Asiatic and American Continents. In neither instance is there flight, in the true sense of the term, similar to that of birds and bats, but the fore and hind limbs are connected by a parachute-like membrane, which, outstretched when the animal leaps from tree to tree, buoys it up and enables its owner to traverse, in a straight and gradually descending line only, very considerable distances.

The smaller squirrel-like form common to the south-eastern districts of Australia, and on account of its predilection for sweets commonly known as the SUGAR-SQUIRREL, makes a most charming little pet. For the most part addicted to sleep, and impatient at being disturbed during the day, towards sundown it wakes up, and is full of frolic. One such example was the writer's traveling companion for a considerable interval in Western Australia. While remaining packed conveniently away in a small box throughout the day, it was accustomed to enjoy the liberty of whatever apartment its owner occupied in the evening and throughout the night, returning of its own accord to its sleeping-box with the approach of dawn. On one exceptional occasion, however, Master Tiny, as this individual was named, was missing in the morning from his accustomed crib, and a prolonged search and examination of every corner and article of furniture that could afford shelter failed to recover him. That the little creature was lost through some one having unwittingly left the door of the apartment open, permitting its escape, was the only and much deplored conclusion that could be arrived at. Towards evening, however, there was a slight rustle close at hand, and Master Tiny was discovered emerging, like Minerva from the head of Jupiter, from the top of one of the old-fashioned china dogs that decorated the hotel room mantelpiece. The ornament, seemingly intact from the front, had the back of the head battered in. Through the resulting crevice the little animal had managed to squeeze itself, having come to the conclusion, doubtless, that this newly chosen retreat more nearly resembled the cavernous shelter of its native tree-spout than its accustomed artificially constructed box. This singular domicile Master Tiny was permitted to monopolise for the remainder of his sojourn at that hostelry. One of the favourite diversions of this little phalanger during the evenings was to climb up the curtain and cornice of the room he occupied, and thence hurl himself through the air with outspread parachute to the writer at the opposite end. The apartment, happening to be the commercial room of the hotel, some thirty feet in length, gave him good scope for exercising his characteristic flying leaps. The attitude invariably maintained during these flights is aptly illustrated in the accompanying photograph; the body is never poised with the head inclined downwards, as is commonly depicted in artists' fancy sketches of the animal contained in popular natural histories. A friend of the writer's in Tasmania, who kept one of these flying-phalangers as a household pet, was accustomed to leave a crevice of the window open at night, so that the little fellow could go in and out as it liked. After the manner of most pets, however, a day arrived upon which its box was found vacant, a marauding cat or other disaster having apparently compassed its untimely end.

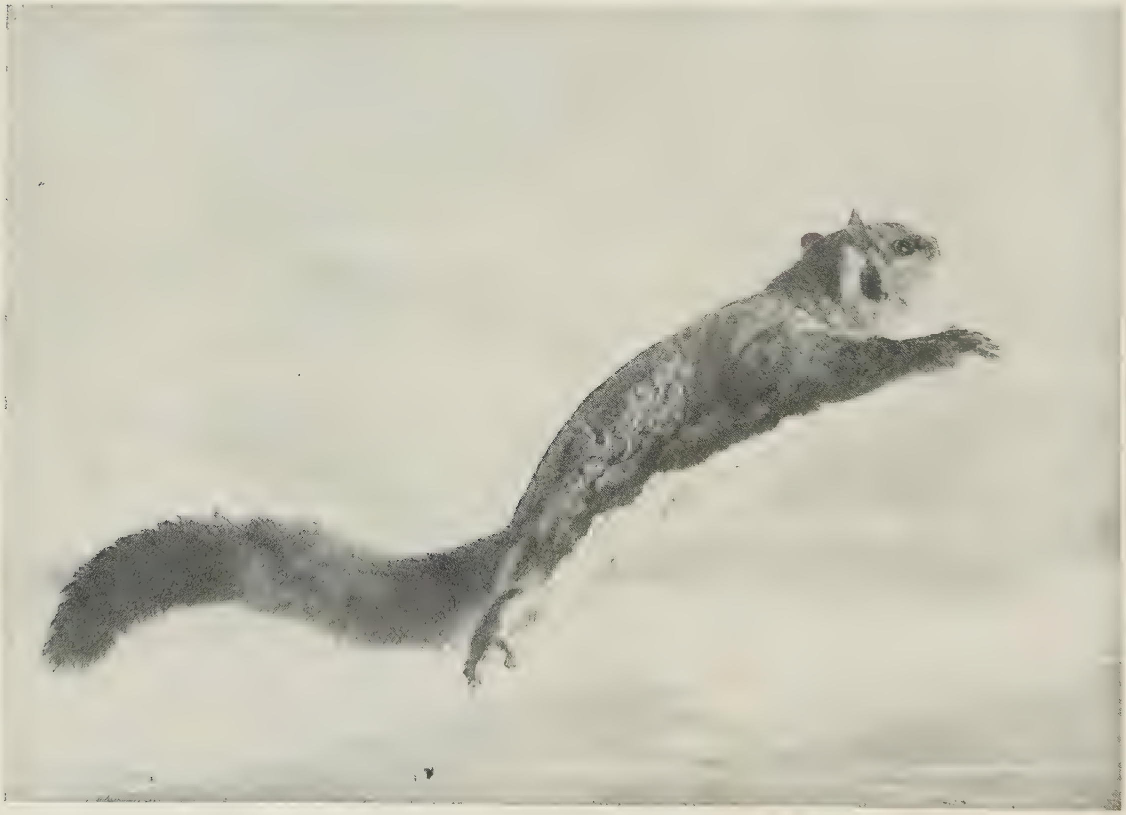


Photo by W. Saville-Kent, F.Z.S.

LESSER FLYING-PHALANGER

Illustrating position maintained during its remarkable flying leaps

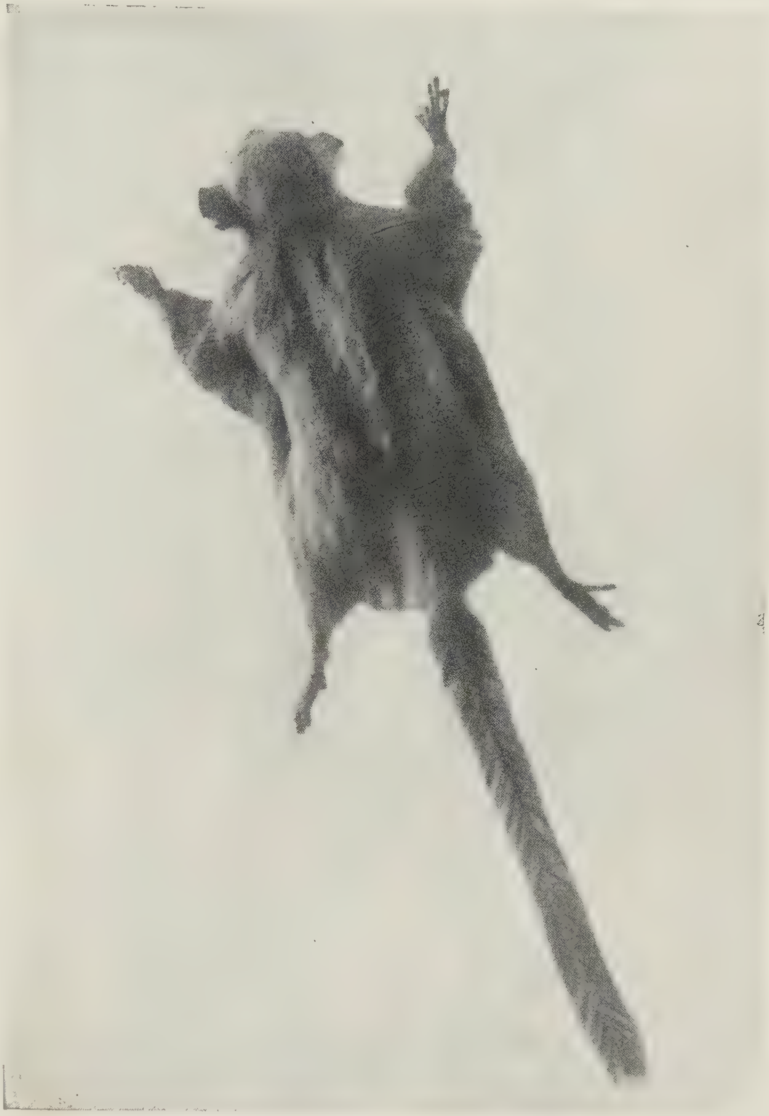


Photo by W. Saville-Kent, F.Z.S.

PYGMY FLYING-PHALANGER

A life-size photograph. The hairs of the tail in this animal are arranged in two parallel lines, like the vanes of a bird's feather

The larger flying-phalanger, the dimensions of our domestic tabby, and with fur as long and as soft as the Persian variety, is less frequently domesticated. It has, in fact, an evil reputation for scratching, biting, and general untamableness. One that was kept for some little time by the late Dr. Bennett, of Sydney, and brought to England, never entirely lost its innate savagery. On the voyage from Australia it became sufficiently tame as to be allowed occasionally to run about on the deck, and was so far amiable as to lay on its back and permit itself to be tickled. On attempting to handle it, however, " it displayed its usual savage disposition, digging its sharp claws and teeth into the hands of its captor." The writer was fortunate in being the recipient in Queensland of a couple of these large phalangers which were exceptions to the usual rule. These specimens—a mother and its young male offspring—also varied in colour from normal examples, which are usually dark slate or blackish brown above and whitish underneath. The mother in this instance was a beautiful cream-white throughout; and her young one, while dark chinchilla-grey upon the back, limbs, and tail, had white ears and breast. Both were very friendly, and would of their own accord climb over their owner's person, seeking in his pockets for hidden lumps of sugar and other acceptable dainties. As with the smaller squirrel-like forms, they slept throughout the greater portion of the day, waking to activity and making excursions in search of their food as soon as the sun went down. The tail of this species of phalanger is abnormally long and furry, but not prehensile. It was observed of them that when feeding leisurely on the gum-tree leaves this appendage was permitted to hang or rest loosely, but that when walking along the branches they would very frequently coil this member into a tight spiral coil, like a watch-spring or the proboscis of a butterfly, against their hindquarters. This phenomenon is apparently unique among mammals. Although generally seeking the darker retreat of their box for their long daylight sleep, the female, more particularly, would frequently simply curl herself up into a furry white ball in one corner of the cage, the head, limbs, or other features being at such times altogether indistinguishable. The aid of the magnesium flash-light was successfully called into service to secure the photographic likeness of this animal, here reproduced, which was taken while it was enjoying its evening meal.

Photo by W. Saville-Kent, F.Z.S.

COMMON GREY OPOSSUM, OR PHALANGER

The fur of this species is in great demand for the manufacture of carriage-rugs

As previously mentioned, some representatives of the flying-phalanger group are no larger than mice, and are furnished in a similar manner with a parachute-like membrane that enables them to take abnormally long flying leaps, or as it were to sail horizontally through the air. The PYGMY FLYING-PHALANGER, whose length of body does not exceed 2½ inches, is one of the most interesting. The tail in this form is also adapted for aerial flotation, the long hairs that grow upon this appendage being arranged in two parallel lines like the vanes of a feather. Its distribution is limited to the south and eastern districts of the Australian Continent. There are also a number of mouse- and squirrel-like phalangers destitute of the flying-membrane, which in this respect very closely resemble in external aspect more typical members of the Rodent Order. One form in particular, the STRIPED PHALANGER of New Guinea, decorated with broad longitudinal black and white stripes, is singularly suggestive of some of the variously striped American squirrels. This interesting island of New Guinea also produces a little PYGMY PHALANGER with a feather-like tail which, except for the absence of a parachute or flying-membrane, is the very counterpart of the Australian kind. Another species, which in shape, size, and more especially with reference to its long, pointed snout, closely resembles a shrew-mouse, is found in Western Australia. The tail of this species, known as the LONG-SNOUTED PHALANGER, is highly prehensile; and it is also provided with a long, slender, protrusile tongue, with which it abstracts the honey from Banksias and other flowers, upon which it customarily feeds.

The two large phalangers known as the BLACK and GREY or VULPINE OPOSSUMS, which are chiefly laid under contribution for the Australian fur supplies, are provided with prehensile tails, the under side of the extremity of which grasps the supporting fulcrum and is devoid of hair. The adaptation of the tail for use as a fifth hand — as in the New World monkeys — is, however, much more conspicuously manifested in what are known to the colonists as the RING-TAILED OPOSSUMS, and to zoologists as CRESCENT-TOOTHED PHALANGERS. In these the tail tapers to a fine point, and the hair throughout the terminal third of this appendage is so fine and short that it at first sight presents the appearance of being entirely naked. This terminal third of the tail, moreover, in the greater number of species, contrasts with the remaining portion by being white in hue. It occasionally happens, however, that individuals occur which are entirely white. One such which came into the writer's possession was obtained from the Bruni Islands, in the Derwent Estuary, Tasmania, and afterwards became a great pet with the young people at Government House, Hobart. It is an interesting circumstance that the Bruni Islands were noted for the production of albino animals of various descriptions, white kangaroos and white emus having also been obtained from this locality. Probably some peculiarity of the soil, and its action on the vegetable food the animals

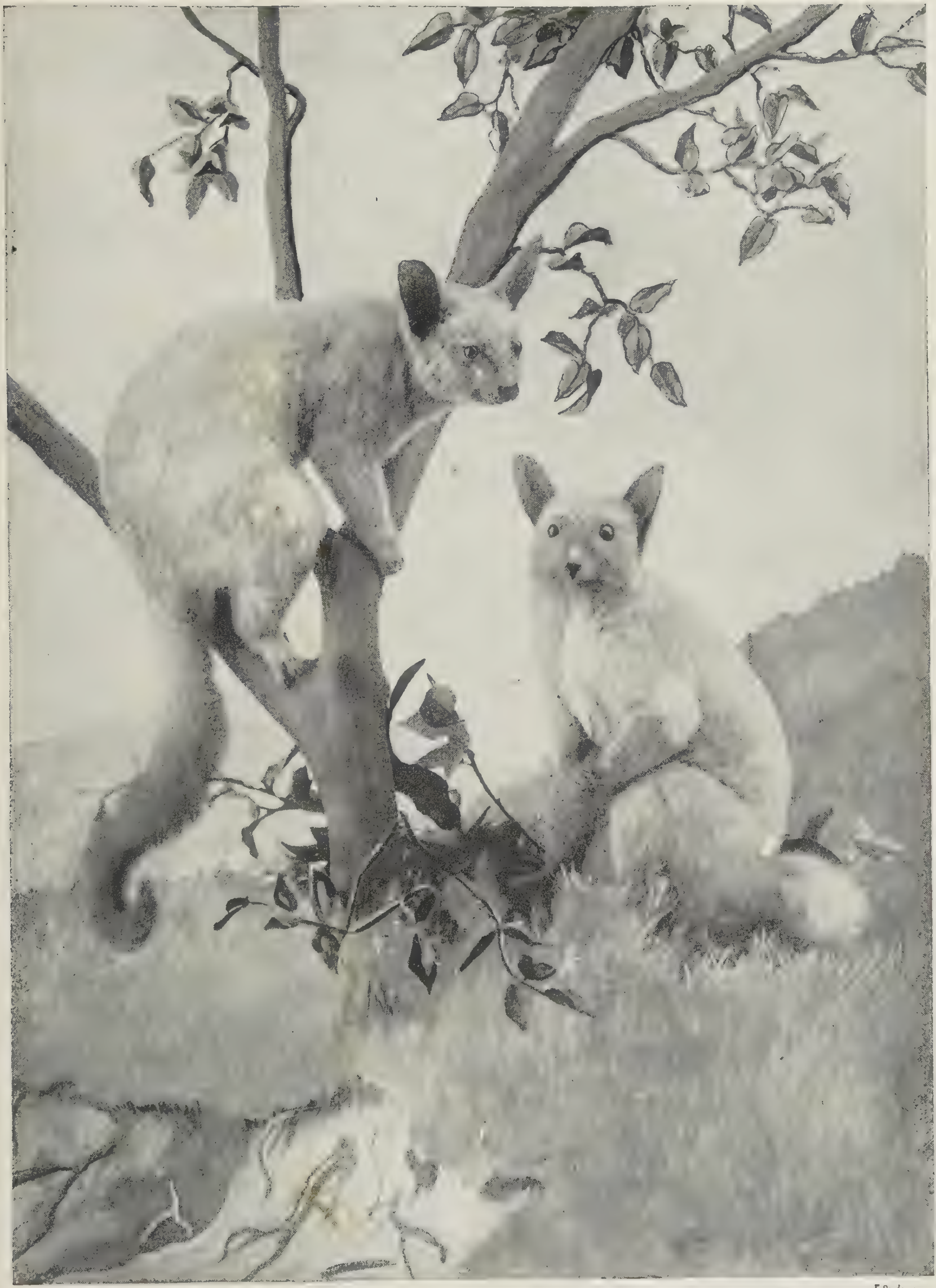


Photo by Henry King] [Sydney

AUSTRALIAN GREY OPOSSUM, OR PHALANGER

On account of its "foxy" appearance, this species is also known as the Vulpine Phalanger consumed, played an important part in the unusally frequent occurrence of this phenomenon.

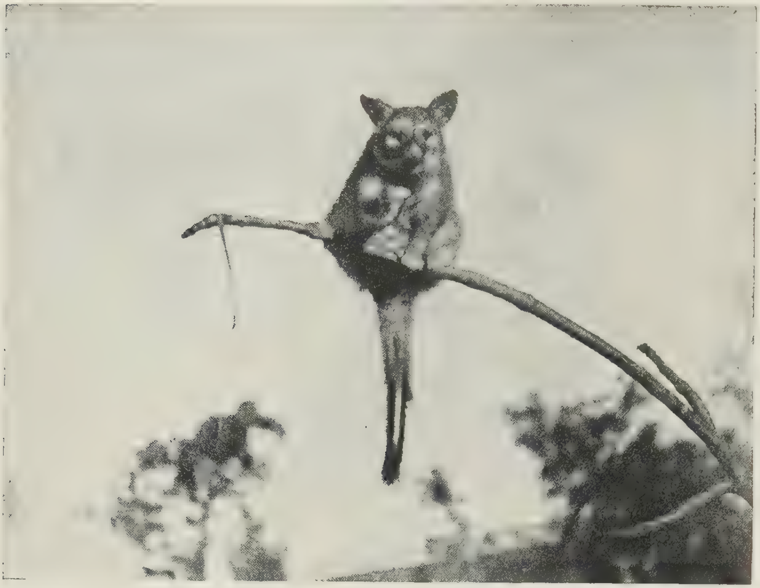


Photo by W. Saville-Kent, F. Z. S.

FRONT VIEW OF GREY OPOSSUM, OR PHALANGER

Displays the bare under-surface of the prehensile tail

The ring-tailed opossums differ essentially from the common opossum or phalanger and its allies in their life habits. While these latter habitually take up their abode and bring forth their young in hollow trees, the ring-tailed species construct a regular nest of interlaced sticks, leaves, grass, or any other available material for their domicile. The structure much resembles the nest, or "drey," of our own familiar squirrel, and may be perched high up among the tree branches or within only a few feet from the ground among the scrub thickets. In New Guinea a variety of these ring-tailed phalangers occurs, not found in Australia, which has no white tip to its tail, and the ears are very short and wide. The group as represented by this species leads to the consideration of the so-called CUSCUSES or typical phalangers indigenous to New Guinea and North Queensland, though but rarely seen there, which, as an exception to the Marsupial Tribe, are distributed among the Indo-Malay Islands as far westward as Celebes. In the cuscuses the tail is altogether naked, and pre-eminently prehensile throughout almost its entire terminal moiety ; the ears are round and, proportionately, exceedingly small; while the fur is very short, thick, and woolly. Compared with the opossums or phalangers, the cuscuses are very dull and sluggish in their movements, creeping slowly among the branches of the trees to browse on the fruit and leaves which constitute their principal diet. Like the opossums, however, or even to a greater extent, they vary this vegetarian regimen with insects or an occasionally captured bird.

THE CUSCUSES

The familiar SPOTTED CUSCUS of New Guinea is the most ornate marsupial mammal. The males, more especially, are as variegated in colour as a tortoiseshell cat, their tints, moreover, closely corresponding in hue with those of the feline. No two individuals, however, are precisely alike in this respect. Usually the ground-colour of the

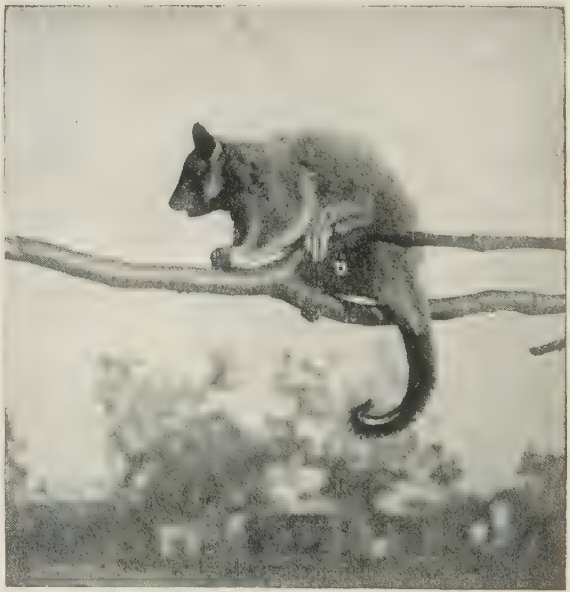
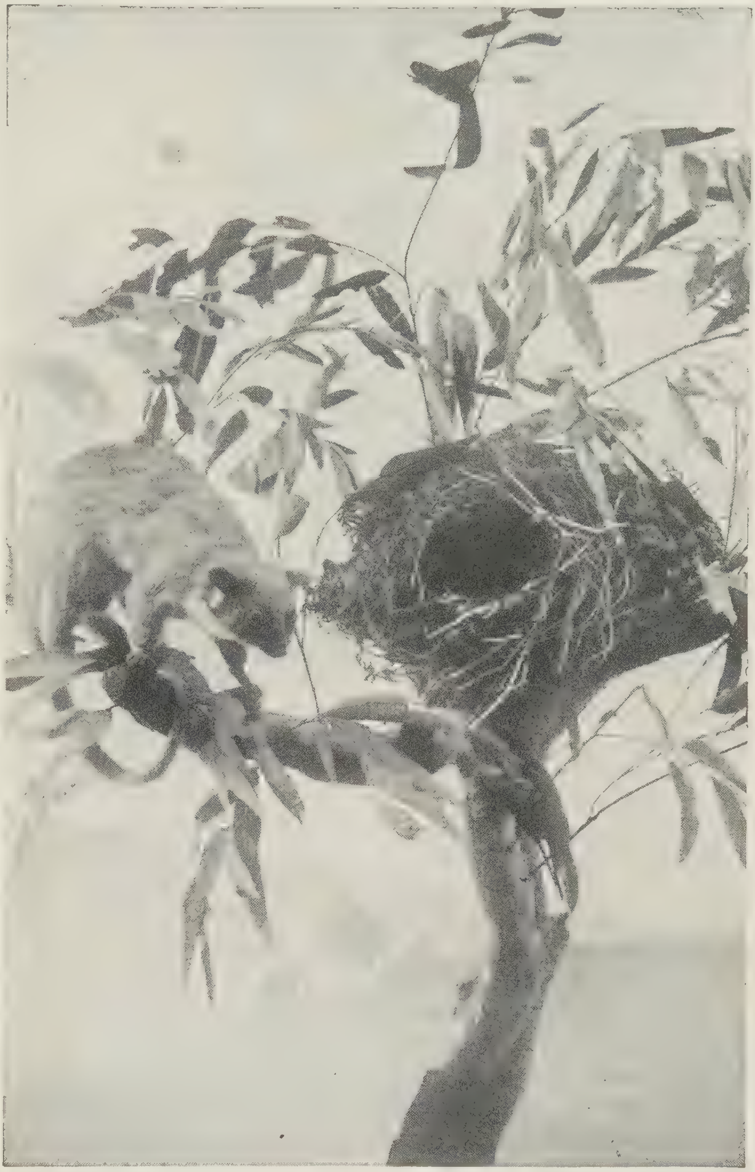


Photo by W. Saville-Kent, F.Z.S

PROFILE VIEW OF GREY OPOSSUM, OR PHALANGER

The opossums are usually shot by moonlight, as seen silhouetted against the sky



By permission of S. Sinclair, Esq.] [*Sydney*

RING-TAILED OPOSSUM, OR PHALANGER, AND NEST

This is the only Australian opossum which builds a regular nest

back is a dirty or creamy white, interspersed with various-shaped blotches of nut-brown or black; the chin, breast, and under-parts are a purer white, and the limbs grey or reddish brown, or, as shown in the photograph over-leaf, mottled like the body. The BLACK CUSCUS of Celebes is, as its name denotes, a much more sombre-looking animal, and is also the largest species, its dimensions equalling or exceeding those of a large cat. The uniformly tinted GREY CUSCUS of Timor, Amboina, and other of the Indo-Malay Islands is very similar in size and aspect, excepting for the half-naked tail, to the common ring-tailed phalanger. All the cuscuses are of rare occurrence in even their most favoured habitats. On one occasion the writer came across an example of the grey species in the scrub forest of Thursday Island, Torres Straits. In this instance, however, it is doubtful if the animal was not an escaped pet brought over from the neighbouring coast of New Guinea.

Much interesting information concerning different varieties of the cuscus is contained in Dr. Alfred Wallace's interesting work "The Malay Archipelago." An anecdote of one which was brought to this naturalist during his residence in the Aru Islands — the headquarters of the great bird of paradise — is thus related: "Just as we had cleared away and packed up for the night, a strange beast was brought, which had been shot by the natives. It resembled in size and in its white woolly covering a small fat lamb, but had short legs, hand-like feet with large claws, and a long prehensile tail. It was a Spotted Cuscus, one of the curious marsupial animals of the Papuan region, and I was very desirous to obtain the skin. The owners, however, said they wanted to eat it; and though I offered them a good price, and promised to give them all the meat, there was great hesitation. Suspecting the reason, I offered, though it was night, to set to work immediately, and get out the body for them, to which they agreed. The creature was much hacked about, and the two hind feet almost cut off, but it was the largest and finest specimen of the kind I had seen; and after an hour's hard work I handed over the body to the owners, who immediately cut it up and roasted it for supper."

The remarkable tenacity of life possessed by the cuscus is fully attested to by Dr. Wallace. He says: "They move about slowly, and are most difficult to kill, owing to the thickness of their skins and tenacity of life. A heavy charge of shot will often lodge in the skin and do them no harm, and even breaking the spine or piercing the brain will not kill them for some hours. The natives everywhere eat their flesh; and as their motions are so slow, easily catch them by climbing; so that it is wonderful that they have not been exterminated. It may be, however, that their dense woolly fur protects them from birds of prey, and the islands they live in are too thinly inhabited for man to be able to exterminate them."

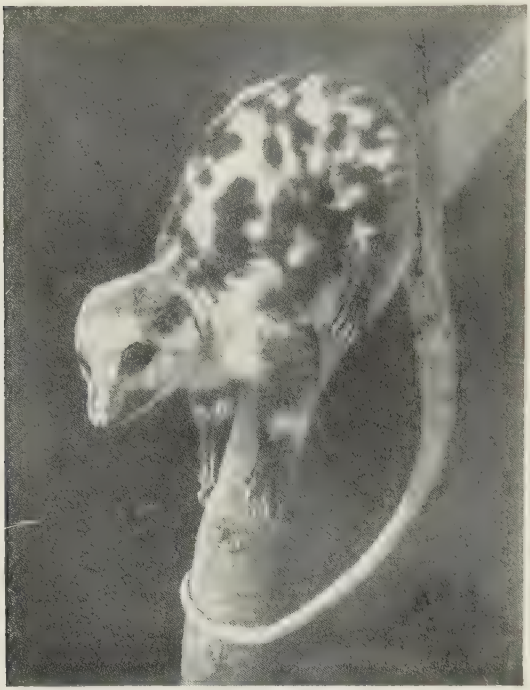


Photo by W. Saville-Kent, F.Z.S.] *[Croydon*

SPOTTED CUSCUS

The cuscuses are sleepy animals, with soft, woolly fur, which in this species is curiously variegated in colour

One of the most notable circumstances respecting the cuscus is the fact that it is one of the few marsupials whose geographical distribution extends so far east in the Malay Archipelago as to be found associated with many of the higher mammalia which are altogether unrepresented in Australia or New Guinea. The Moluccas, including notably the islands of Silolo, Ceram, Boru, and many smaller ones, for example, produce no less than three species of cuscus, and are also the home of a species of baboon, a civet-cat, a deer, and that remarkable pig the babirusa. One other marsupial, a little flying-phalanger, is likewise a denizen of these islands. It has been suggested by Dr. Wallace that none of the foregoing higher mammals are possibly indigenous to the Moluccas. The baboon, he remarks, is only found in the island of Batchian, and seems to be much out of place there. It probably originated from some individuals which escaped from confinement, these and similar animals being often kept as pets by the Malay inhabitants and carried about in their praus. The civet-cat, which is more common in the Philippines and throughout the Indo-Malay region, is also carried about in cages from one island to another, and not infrequently liberated after the civet has been abstracted from them. The deer, which is likewise tamed and petted, its flesh also being much esteemed for food, might very naturally have been brought by the Malays from Java with the express object of its acclimatisation. The babirusa, whose headquarters are in the island of Celebes, is only found in Boru, its nearest neighbour in the Moluccan group. Dr. Wallace anticipates that these two islands were in former times more closely connected by land, and that under such conditions the babirusa may have swum across the intervening channel. Should these several hypotheses be correct, the Molucca Islands must not be regarded, from a zoological standpoint, as an essentially Australasian or marsupial-producing region.

The Wombats

The Wombat Family, claiming the next position in the marsupial galaxy, constitutes the very antithesis to the light and graceful arboreal phalangers. There are but three known species, one of these inhabiting Tasmania and the adjacent islands, while the other two are peculiar to the southern region of the Australian Continent. In forms and gait their thick-set tailless bodies suggest a cross between a small bear and a capybara, and as "bears" and "badgers" they are familiarly known by the Australian colonists. The badger simile is perhaps the most pertinently applied with reference to their habit of excavating huge earth-burrows as dwelling-places, and out of which they customarily emerge only at night to feed. The TASMANIAN WOMBAT, at all events, is essentially gregarious in its habits. In the neighbourhood of Swansea, on the east coast, it is, or was, particularly abundant, forming regular warrens among a light undergrowth of vegetation, through which traveling on horseback is a distinctly risky proceeding. The temperament of the wombat is peculiarly placid; and hence, as it might be anticipated, they are essentially long-lived. One, Charlie by name, which has been domiciled at the Zoo for the past thirty years, is still hale and hearty, and evidently disinclined yet awhile to immolate himself on the altar of fame as a much-needed successor to the antique effigy which has for so long represented his species in the British Natural History Museum. Waiting for dead men's shoes is a proverbially tedious task, and for a coveted wombat's skin evidently more so.

The tough hide, with its thick, harsh fur, of the Tasmanian wombat, or "badger," as it is locally dubbed, is somewhat highly prized in the land of its birth. For floor- and door-mats and rugs the pelt is practically indestructible; and as such, though scarcely a thing of beauty, the special pride of the thrifty housewife. This animal is also not infrequently made a household pet, and will waddle as complacently as an over-fed poodle around the premises after its owner. The wombat, like the large majority of the marsupial animals, is for the most part nocturnal in habits, and a strict vegetarian.

The wombats present several interestingly distinct structural peculiarities. In the first place, their teeth, which are twenty-four in number, all grow uninterruptedly throughout life, and are consequently devoid of roots. The incisor teeth are represented by but a single pair in each jaw, and, having enamel only on their front surfaces, wear away in a chisel-like form. as in the beavers and other rodents. Superficially in both form and habits, as well as in the character of their dentition, the wombats may in fact be aptly likened to some unwieldy representative of the Rodent Order. Another structural peculiarity of the wombat is that it is the proud possessor of two more pairs of ribs than any other marsupial.

Of the three known species, the COMMON WOMBAT of the South and Eastern Australian States is the largest, attaining to a length of as much as 3 feet. The colour of this form is subject to considerable variation, being sometimes yellow, yellow more or less mixed with black, or completely black. Albinism, as in the kangaroos and phalangers, is of apparently rare occurrence. The hair, while coarse, is less so than in the Tasmanian species. What is known as the HAIRY-NOSED WOMBAT, inhabiting South Australia, is intermediate in size between the common and the Tasmanian varieties:

Photo by E. Landor

COMMON WOMBAT

A burrowing animal about the size of a small pig its most distinctive features are the soft and silky character of its brownish hair, and its longer and more pointed ears. The coarseness of the hair of the Tasmanian species has been previously referred to; in colour it is most usually a dark greyish brown, while the ears are small and rounded.

The flesh of the wombat is somewhat esteemed for food, being regarded by some as equal to pork, and much resembling it in flavour. The predilection of tame specimens for milk is very strong, and it has been recorded of one animal that it was not only in the habit of seeking out the milk-pans and pushing off the covers in order to drink the contents, but afterwards of taking a bath in what was left.

A remarkable habit has been accredited to the wombat which invites scientific investigation. It is said to be capable of sustaining life for an abnormally long period under water, and that when in the course of its travels it meets with a pond or river it does not attempt to swim, but, deliberately entering the water, walks along the bottom, and so emerges on the opposite bank.

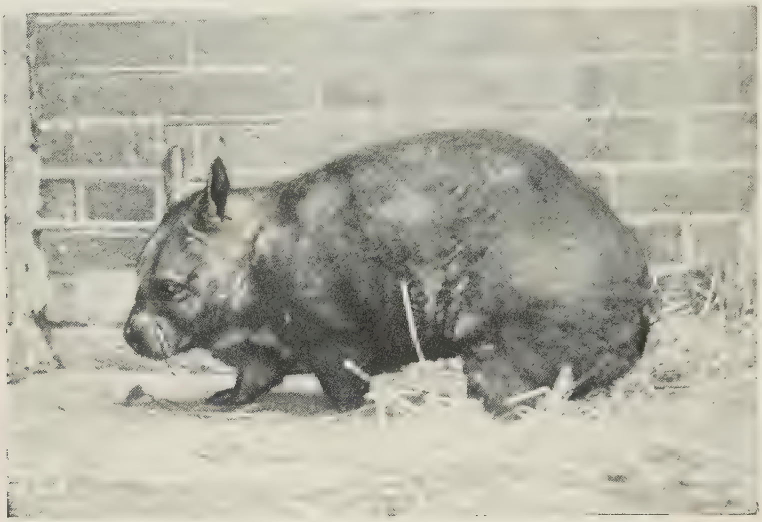


Photo by F. Landor

HAIRY-NOSED WOMBAT

A form peculiar to South Australia

The animals of Australia living in not very remote geological times included a near ally of the wombat which equalled a tapir in dimensions.

THE BANDICOOTS

The Australian BANDICOOTS—not to be confounded with their namesake of India, which is a big rat — constitute a very distinct little family group. They number in all some eight or nine species, distributed throughout the length and breadth of Australia and Tasmania, and found also in New Guinea. The largest member is about the size of a rabbit; and as its general shape, long ears, and soft silky hair impart some slight resemblance to that rodent, it is commonly known as the RABBIT-BANDICOOT. With the above-enumerated points, however, the likeness ceases — its possession of a moderately long tail, pointed snout, and feet modified on a plan closely resembling those of the kangaroo's indicating its essentially distinct nature. In a second variety, having somewhat the same external contour, but smaller in size, the fore limbs are very short, and the feet so modified that only two toes are visible externally. With reference to this peculiar feature, it is known as the PIG-FOOTED BANDICOOT. In a third kind of similar dimensions, with harsh brown fur, the ears are comparatively short, and the snout is so abnormally prolonged that it has been appropriately named the LONG-NOSED BANDICOOT. Superficially, in point of fact, this and other allied species so closely resemble certain of the long-snouted insectivorous mammals, such as the Tenrec and Solenodon, that they might be excusably mistaken by the non-scientific for members of the same group. The bandicoots are chiefly nocturnal, and at all events incorrigible "sun-downers," turning up for their meals when the evening shadows fall, and taking a heavy and unwelcome toll of the farmers' potatoes, beets, or other root crops. Like the wombat, already described, they are earth-burrowers. Some of them, however, construct nests above-ground in long coarse grass or low tangled shrubs, which are so ingeniously built in accord with their environment as to readily escape detection.

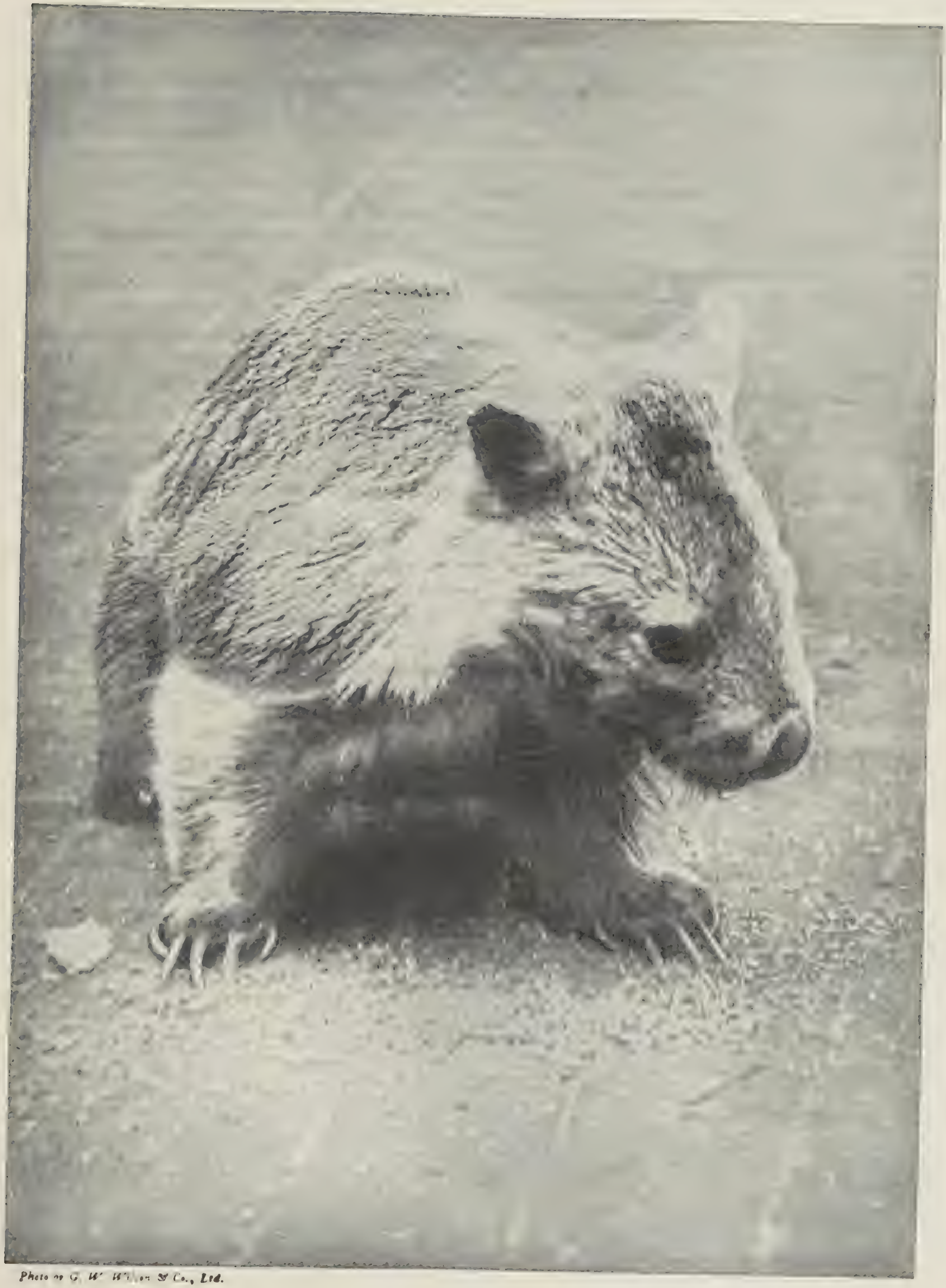


Photo by G. W. Wilson & Co., Ltd.

COMMON WOMBAT

The Wombats may be said to hold the place occupied in other parts of the world by the Badgers

Insects and worms, in addition to a main diet of vegetable matter, contribute to the bandicoot's somewhat heterogeneous menu.

The wood- and root-boring larvæ of a moth which infests the Australian wattle- or acacia-trees are a very favourite food with several of the species, and it is worthy of remark that the bandicoots are not alone in displaying a penchant for this delicacy. Under the title of "bardies" they are collected and highly esteemed for food by the natives of Western Australia, who eat them either cooked or raw. These larvæ are, moreover, acceptable to many European palates, and the writer has witnessed little faggot-like bundles of them brought round by the natives to the hotels at Geraldton, Western Australia, for sale or barter to chance customers. It may be observed in this connection that the analogous wood-boring larvæ of the goat-moth, which were kept and specially fattened for the occasion, constituted one of the dainty dishes of the luxurious Romans.

One of the commonest species found in Tasmania is known as the BANDED or STRIPED-BACKED BANDICOOT, being so named on account of the characteristic markings of its fur. The general ground-colour of the coat is an almost equal admixture of black and yellow hairs, the black tint, however, prevailing on the back, and the lighter one on the sides. The hindquarters are, however, variegated by the presence of some three or four broad transverse stripes that are almost entirely black, while the intervening spaces are a light whitish yellow. A few shorter stripes are sometimes continued as far as the root of the tail, this appendage also having a dark line running along its upper surface. The head is of a somewhat lighter tint than the remainder of the body, while the breast, abdomen, and feet are white, slightly tinged with grey. The transversely striped pattern of ornamentation of the hindquarters of this bandicoot is of interest with relation to the circumstance that a similarly located banded variegation of the fur occurs also in the Tasmanian wolf, or thylacine, and in the banded ant-eater, described in a following section. As a colour-pattern it would appear to be quite peculiar to these marsupials, no such restriction of the markings occurring among the higher or placental mammals. In the South African suricate, a member of the Ichneumon Tribe, in which the nearest approach to this dorsal banding is met with, the stripes are equally developed as far forward as the base of the neck.

Both the banded and other species of bandicoots are extremely swift and active in their movements, and are at the same time noted for the singularity of their gait. This consists of a half-running and half-jumping action, induced by the peculiar structure of their feet and greater length of the hind legs, which are modified on a plan intermediate between that of the kangaroos and the dasyures, or native cats. The back of the animal while running being highly arched, adds to the grotesqueness of its appearance. Like the native cats, the pouch in the bandicoots opens backwards; it is furnished with eight teats, but not more than two young are usually produced at a birth.

The striped-backed bandicoot is not infrequently adopted as a household pet, in spite of its notorious garden depredations. When thus domesticated, it appears to be capable of developing a strong attachment for its owner. One that was owned by friends of the writer especially attached itself to the lady of the house. It was acquired when quite young, having escaped from the pouch of an adult

Photo by W. Saville-Kent, F.Z.S.

LONG-NOSED AUSTRALIAN BANDICOOT

Bandicoots, although larger, have somewhat the appearance of shrews

Photo by W. Saville-Kent, F.Z.S.

RABBIT-BANDICOOT

The largest of the bandicoots; about the size of a rabbit

female which the dogs had killed, and being then about the size of a mouse. It speedily learned to lap milk, and throve on a diet of bread and raw potato. As it grew larger it was allowed the run of the house, and also of the garden, but habitually returned to the sleeping-quarters selected by itself, and represented by the woolly depths of its mistress's work-basket. In this haven of rest it slept all day, scolding and snapping at any intruding hand. Towards dusk it would waken up and bustle about in a most energetic manner, with the air, in fact, of having an immense amount of business to transact within the very shortest limits of time. Its first dart was always towards a corner where a supper of bread-and-milk and potato was usually placed. This meal discussed, its evening's occupation commenced of scampering around the room and over every accessible article of furniture. Nor was it shy of climbing up and resting for a few seconds on the shoulders of its human friends, being always, however, in too great a hurry to prolong the visit. Finally, as with all pets, "Coota," as he was familiarly named, came to an untimely end — not a cat, however, on this occasion, but, if rumour whispers true, through over-indulgence in a too liberally furnished meal of custard pudding.

The flesh of this and other species of bandicoots is esteemed for food both by the natives and the white settlers in Australia. It is noteworthy of the banded variety, more especially, that the skin adheres so tightly to the flesh that its removal is a matter of some considerable difficulty. When full grown, this species measures as much as 18 inches in total length, and is little inferior to a rabbit with regard to the amount of good meat it provides for the larder.

The Pouched Mole

A still more essentially insectivorous marsupial is represented by the little mammal discovered only a few years since in the wild sandy wastes of Central Australia. In form and habits it so nearly resembles the familiar European mole that the title of the Pouched Mole has been very suitably given to it. At the same time, with regard to its remarkable organisation, it constitutes the sole representative of its peculiar family group. The first suspicions of the existence of this singular little animal were raised by the observation of peculiar sinuous three-lined tracks at irregular intervals on the surface of the sandy regions it inhabits.

After a long quest, with the aid of the aborigines, the first specimen was discovered reposing under a tuft of coarse porcupine-grass. A further investigation elicited the fact that its burrowing proclivities were much less pronounced than those of the ordinary moles, the little creature progressing alternately over the surface of the sand, and then ploughing its way, for several feet or yards, two or three inches only beneath the surface. All efforts to preserve examples of this marsupial alive for longer periods than three or four days proved abortive; for though the remains of ants and other insects were found within its viscera, it refused to feed upon the living supplies that were provided for it. In fact, the animal itself apparently ran the greater risk of being eaten.

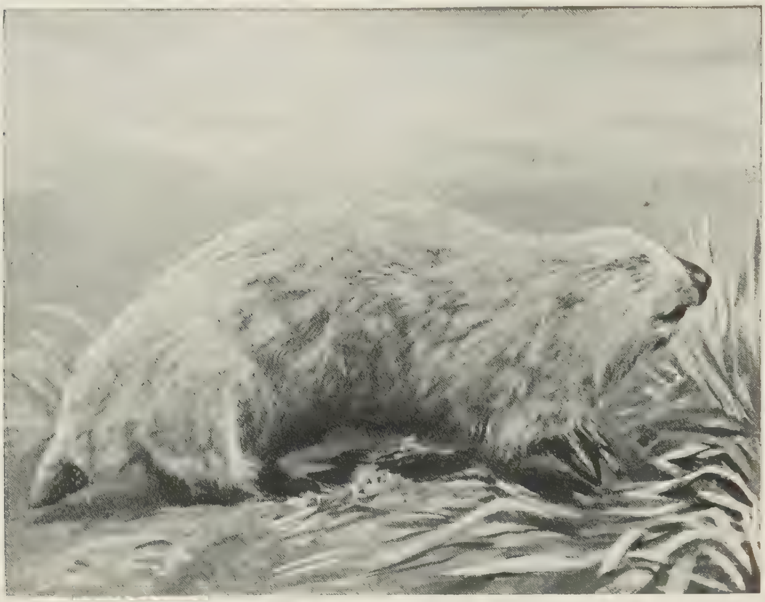


Photo by A. S. Rudland & Sons

POUCHED MOLE

This animal is of a pale golden-red colour, and about 5 inches long. It spends most of its time burrowing, which it can do with great rapidity, in the sand of the Australian deserts in search of insects

The colour of the pouched mole is for the most part light fawn, varying in parts to golden yellow. One of its most conspicuous features, as illustrated in the accompanying photographs, is the abnormal size of the third and fourth toes of the fore limbs, their peculiar scoop-like character proving of eminent service to the animal in its customary sand-burrowing habits.

THE TASMANIAN WOLF

The remaining family of the Australian marsupials constitutes a parallel to the carnivorous order of the higher mammalia, all its members being more or less flesh-eaters, and having their dentition modified with relation to such habits. One of these (the TASMANIAN WOLF, or TIGER of the colonists, better known to zoologists as the THYLACINE) is an animal of considerable size. Its dimensions equal those of a wolf or mastiff, with which the contour of its body and more especially that of the head very nearly correspond. In common with the true dogs, the thylacine hunts its prey by scent. This is well attested to by the following incident, as related by eye-witnesses. While camping out among the hills in Tasmania their attention was attracted very early one morning by a brush-kangaroo hopping past their fire in an evidently highly excited state. Some ten minutes later up cantered a she thylacine with her nose down exactly on the track, evidently following the scent, and in another quarter of an hour her two cubs came by also in the precise track. While not very swift, the Tasmanian "tigers" possess immense staying power, and will keep up a long, steady canter for many hours on end. Accustomed in its primitive state to run down and prey upon the kangaroos, wallabies, and other weaker marsupial mammals indigenous to the regions it inhabits, the Tasmanian wolf speedily acquired a predilection for the imported flocks of the settlers, and proved almost as destructive to them as its Old World namesake. To check its ravages, a price was put upon its head by the Tasmanian Government; and this measure, in conjunction with the rapid advances towards the complete settlement of the country which have been accomplished within later years, has compassed this animal's extermination in all but the wildest and

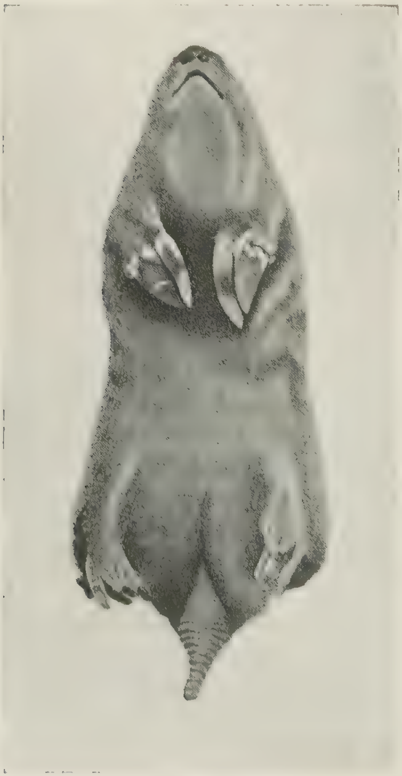


Photo by W. Saville-Kent, F.Z.S.

UNDER SURFACE OF POUCHED MOLE

Notice the abnormal size of the third and fourth toes of the fore limbs, and their peculiar scoop-like shape most inaccessible mountain districts. The colour-markings of this animal are somewhat striking, the grey-brown tints which characterise the ground-hues of the body and limbs being varied by a series of dark bands traversing the buttocks, these being widest in this region, and continued forwards to the middle of the back. A somewhat similar cross-stripe pattern of ornamentation occurs in the relatively small member of the same family described later on as the Banded Ant-eater.

Examples of the Tasmanian wolf have frequently been on view at the Regent's Park Gardens, a very fine young male specimen being at present located in the marsupial section. Within a few weeks of its arrival it was on excellent terms with its keeper, though, owing to its somewhat imperfect sense of vision during the daytime, it was apt to snap somewhat promiscuously at those attempting to cultivate its close acquaintanceship. That a bite from its formidable teeth is not to be lightly risked will be made abundantly apparent by a glance at the successful yawning pose photograph secured of this example by Mr. Medland, and here reproduced. Although the thylacine is at the present time entirely limited in its distribution to Tasmania, it occurs in the fossil state on the Australian mainland; while, singularly to relate, the remains of a closely allied form have within recent years been unearthed in Patagonia. This circumstance, taken in conjunction with the fact that many other fossil types with Australian and New Zealand affinities have been discovered in the same South American strata, has strengthened the supposition maintained by many zoologists that in bygone ages a vast Antarctic continent, spreading through the areas now occupied by the Southern Indian and Pacific Oceans, temporarily united the now distinct lands of South America and Australasia.

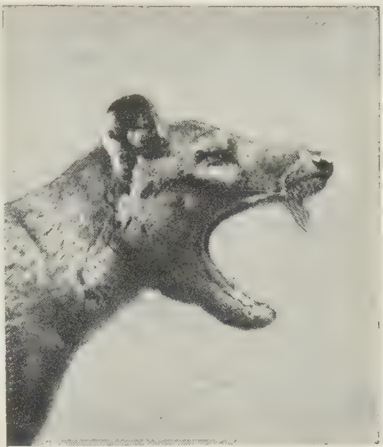


Photo by L. Medland, F.Z.S.

TASMANIAN WOLF

This photograph shows the great width of gape of this ferocious animal

The Tasmanian Devil

Next in size to the thylacine, but possessing a more unenviable notoriety for the uncompromising sulkiness and savagery of its disposition, is the animal which, in virtue of the aforesaid qualities, is known by the title of the Tasmanian Devil. In shape and dimensions this marsupial carnivore somewhat resembles a badger; but the head is abnormally large, the masseter muscles which control the action of the powerful jaws monopolising a very considerable share of the face area. The limbs are short and also very powerful, the front paws being well adapted to its burrowing habits. There is some slight variation in the colours of this marsupial Apollyon; and, as the

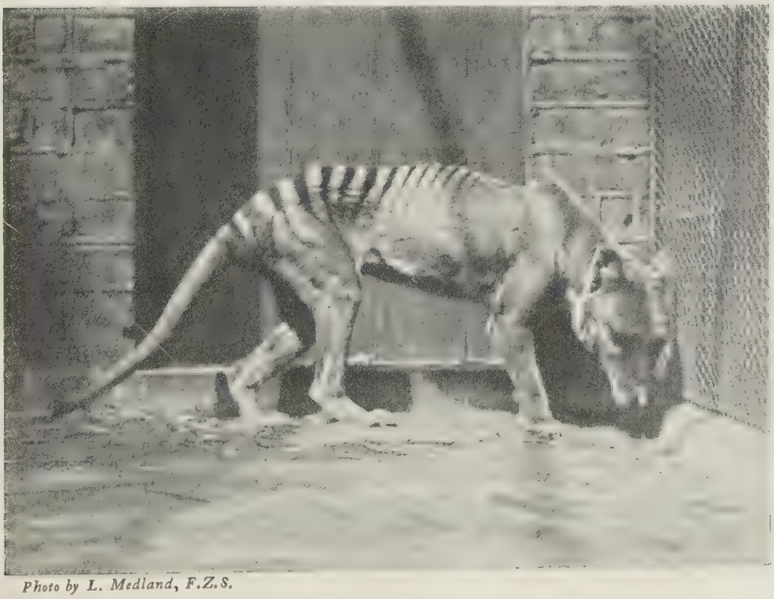


Photo by L. Medland, F.Z.S.

TASMANIAN WOLF

In this photograph are shown nearly all the chief characteristic points of the Tasmanian wolf

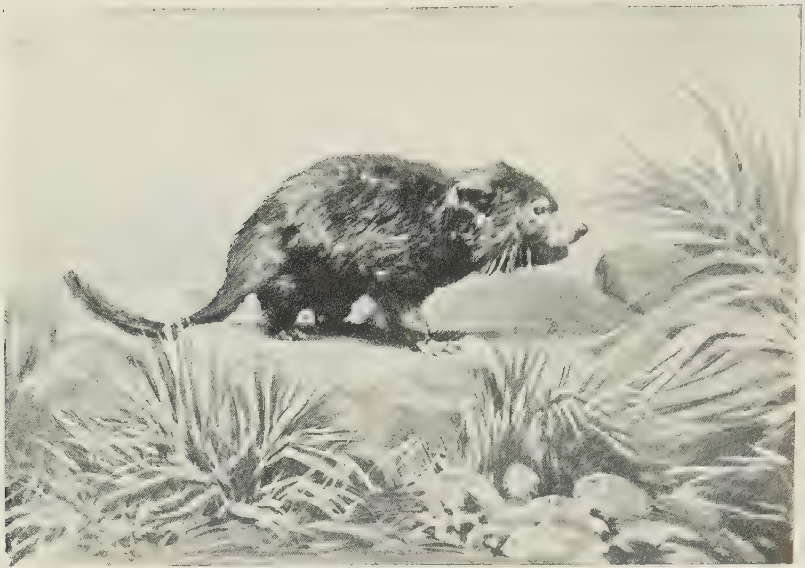


Photo by York & Son

TASMANIAN DEVIL

A small, but stout and powerful animal, very destructive, and absolutely untamable

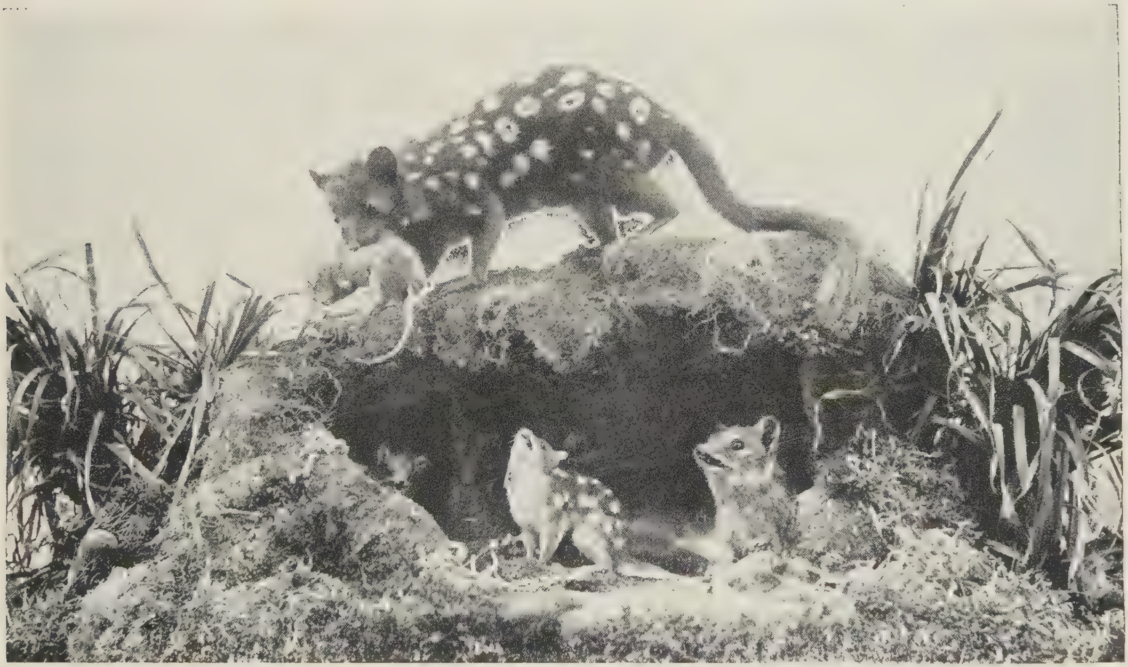
aphorism runs concerning his sable namesake, he is not always so black as he is painted. More or less or in fact mostly black he always is, but there is usually a redeeming thread or patch of white upon his coat. This may take the form of a small star-like spot only on the front of its chest, which not infrequently extends to a narrow crescent-shaped band or line continued round the neck almost to the shoulders. One or more supplementary spots of white may also be developed upon the flanks and hindquarters.

The destructive propensities of the Tasmanian devil, wherein the farmers' sheep and poultry are concerned, are in no way inferior to those of the Tasmanian wolf, and in consequence of their former much greater abundance the havoc these animals committed was the more serious. Placed, like the last-named type, under Government ban, these native devils have, in comparison with the earlier days of colonisation, very considerably ceased from troubling, and with the ever-progressing march of settlement and civilisation will probably be altogether exterminated at a no very distant date. A bag of no less than 150 of these marauders, in the course of one winter, was recorded from an upland sheep-station some twenty or thirty years ago. In common with the thylacine, it has been observed that the Tasmanian devil has a marked predilection for prowling along the seashore in search apparently of crabs, fish, or any acceptable flotsam and jetsam that may be cast up by the waves.

Examples of this most unamiable of mammals were brought in alive on several occasions to the Hobart Museum during the writer's residence in Tasmania, but in all cases obstinately resisted every attempt towards the establishment of a friendly footing. Their ultimate relegation to the specimen-cases was, under the circumstances, unattended by any very poignant manifestations of regret. A fact brought into prominent notice during subsequent post-mortem investigations was the extraordinary extent to which these animals are infested with vermin. Possibly this circumstance is to a considerable extent accountable for the creature's unconquerable irritability. The experiment as to whether a course of disinfecting treatment, by baths or otherwise, would not conduce towards the taming of this native devil, where all other applied methods have failed, would at all events be worth the trial. The bath pure and simple is a wonderful soporific for unruly tempers. As most schoolboys know, a pail of water, from which the patient is withdrawn when a watery grave is apparently inevitable, is an unfailing specific for the taming of mice and other "small deer." The writer's experience with a villainously savage cat which one night fell incontinently into an uncovered cistern, and was rescued by him at almost the last gasp, will not be readily forgotten. That cat, though still a vixen to the ordinary members of the household, forthwith attached itself affectionately to its rescuer, and would sit for hours awaiting his arrival on the doorstep when the business of the day was over. Other fierce creatures, including the Tasmanian devil, would possibly prove amenable to the judicious application of the "water cure."

THE NATIVE CATS

The animals common in Tasmania and throughout the greater portion of the Australian Continent, and familiarly known as SPOTTED or NATIVE CATS, and to zoologists as DASYURES, enjoy also an unenviable reputation for their depredations among the settlers' hen-roosts. To look at, these native cats are the most mild-mannered and inoffensive of creatures. Actually, however, they possess the most bloodthirsty proclivities, and may be aptly compared in their habits to the stoats, weasels, polecats, and other Old World carnivora. There are some five known species, the largest being equal to an ordinary cat in size, and the smaller ones about half these dimensions. All of them are distinguished by their spotted pattern of ornamentation, such spots being white or nearly so, and more or less abundantly sprinkled over a darker background which varies from light grey to chocolate-brown. In the commonest form, represented in the accompanying photograph, the ears and the under surface of the body are also often white. No two individuals, however, are to be found precisely alike in the pattern of their markings. The dasyures differ from the two preceding types, the Tasmanian wolf and the devil, in being essentially arboreal in their habits, living by day and breeding, as the majority of the Australian opossums, in the hollow gum-tree trunks, from which they emerge at nightfall to seek their food. This, in their native state, when hen-roosts are not accessible, consists mainly of birds and such smaller marsupial forms as they can readily overpower.



By permission of S. Sinclair, Esq.] [*Sydney*

SPOTTED DASYURES, OR AUSTRALIAN NATIVE CATS

This species is rather smaller than an ordinary-sized cat. All the dasyures are arboreal in their habits, and very destructive to birds

THE POUCHED MICE

The so-called POUCHED MICE represent a group of smaller-sized carnivorous mammals which have much in common with the dasyures, but are devoid of their spotted ornamentation. None of them exceed a rat in size. They number about twelve or fourteen known species, and are distributed throughout the greater part of Australia and New Guinea, and extend thence to the Aru Islands. They are said not to occur in the extreme north of the Australian Continent. The writer, however, obtained an example of the brush-tailed species,

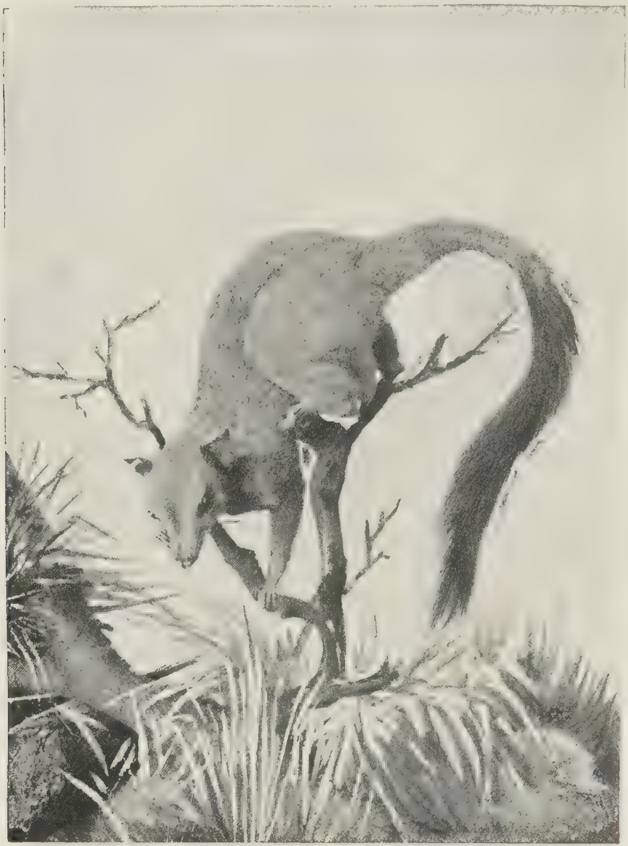


Photo by W. Saville-Kent, F.Z.S.

BRUSH-TAILED POUCHED MOUSE, OR PHASCOGALE

A slender and graceful animal, the largest of the thirteen known species, and about the size of an ordinary cat

here illustrated, from the neighbourhood of Broome, in the farthest north or Kimberley district of Western Australia. This specimen, which was caught alive in a rat trap, exhibited astonishingly potent gnawing powers, almost succeeding one night in eating its way through the wooden box in which it was temporarily confined. The habits of this species are omnivorous, and chiefly akin to those of the ordinary rats, it being accustomed to prowl round the out-buildings at night, picking up any unconsidered trifles in the way of food that may be left unprotected.

Many of the smaller members of this tribe are no larger than mice ; and in one form, known as the JERBOA POUCHED MOUSE, inhabiting Queensland and New South Wales, the hind limbs are abnormally prolonged, and the animal progresses by leaps and bounds, after the fashion of the true jerboas, or its nearer relatives, the ordinary kangaroos and rat-kangaroos.

THE BANDED ANT-EATER

One of the most interesting from the zoologist's standpoint, and the last on our list of the Australian marsupials, is the little creature, limited in its habitat to Western Australia, locally known as the SQUIRREL. The BANDED ANT-EATER, with reference to its striped ornamentation and ant-eating habits, is the name by which it is usually chronicled in natural history works. In size and shape, except for its more pointed snout, its squirrel-like aspect is certainly somewhat striking. Like the true ant-eaters of the Edentate Mammalian Order, it, however, possesses a long protrusile tongue, with which it is accustomed in a similar manner to lick up the ants which constitute its main food-supply.

The most interesting biological peculiarity of this animal is the abnormal development of its teeth. These number as many as from fifty-two to fifty-six, and exceed the dental formula of any other known existing marsupial. The usual colour of this interesting little animal is a warm chestnut-brown, banded transversely over the back with white, these stripes being widest and most conspicuous over the hindquarters. This somewhat paradoxical marsupial possesses no pouch, the young, when first born and attached to the nipples in the manner characteristic of ordinary marsupials, being covered over and concealed among the longer hairs that clothe the abdominal region. In the dasyures, or native cats, previously described, the pouch exists only in a rudimentary condition, its function being fulfilled by merely a few skin-folds ; while in the "tiger" and native devil the pouch, contrary to that of the kangaroos, opens backwards.

In disposition the banded ant-eater presents a marked contrast to that of many of the preceding types. Caught in its native habitat, it does not attempt to bite, and soon becomes reconciled to captivity. The peculiar nature of its diet, however, militates against its being easily transported over-sea from the Antipodes.

THE SELVA.

South America has one other marsupial—the Selva—an animal which, while possessing the dimensions and much of the aspect of an ordinary rat, is remarkable as differing so materially in the character of its teeth and other structural points that it cannot be referred to any existing marsupial family. On the other hand, this type is found to coincide in the above particulars with species hitherto only known in the fossil state, and excavated from the same tertiary deposits in Patagonia which have been productive of the distant ally of the Tasmanian wolf. It is yet hoped by zoologists that the discovery of other interesting and possibly some supposed extinct mammals may reward the thorough exploration of the vast South American forests. The capture in the flesh of some form allied to the huge ground-sloths, such as the Mylodon and Megatherium, is, however, now considered to be quite beyond the pale of possibility.

MONOTREMES, OR EGG-LAYING MAMMALS.

With this group or order of the Mammalian Class we arrive, as it were, on the borderland between the more typical Mammals and Reptiles. In the last group, that of the Marsupials, it was observed that the young were brought into the world at an abnormally early and helpless phase of their existence, and usually consigned, until able to see and walk, to a variously modified protective pouch. With the Monotremes a yet lower rung in the evolutional ladder is reached, and we find that the young are brought into the outer world as eggs, these being in the one case deposited in a nest or burrow, and in the other carried about by the parent in a rudimentary sort of pouch until they are hatched.

The living representatives of this singular mammalian order are but few in number, being restricted, in point of fact, to only two distinctly differentiated family types—the Echidna or Porcupine Ant-eater, and the Platypus. These monotremes, moreover, like the majority of the existing marsupials, are limited in their distribution to the Australasian region. The single species of the Platypus is only found in Tasmania and the southern and eastern districts of the Australian Continent, while the Echidna numbers some three recognised species, two of which belong to Australia and Tasmania and the third to New Guinea.

THE ECHIDNA.

The ECHIDNA, PORCUPINE ANT-EATER, or "PORCUPINE," as it is commonly called by the Australian colonists, would seem at first sight to represent an animal in which the characters of the hedgehog and the common porcupine are interblended, the innumerable spines being longer than those of the former, but less in length than those of the last-named animal. The head, with no externally visible ears and remarkable elongated beak-like snout, however, at once proclaims it to be altogether distinct from these. The animal has no teeth, and the tiny mouth at the termination of the beak-like snout simply constitutes an aperture for the extrusion of the worm-like glutinous tongue, wherewith, after the manner of the true ant-eaters, it licks up the inhabitants of the ants' nests upon which it feeds. For tearing down the ants' nests and obtaining its customary food, as also for its inveterate burrowing propensity, the feet, and more especially the front ones, are provided with strong, blunt, and very powerful claws. The male animal is in addition armed on the hind feet with a peculiar supplementary spur, which is, however, still more conspicuously developed in the platypus.

Three distinct species of the echidna are recognized by zoologists. The one peculiar to the cooler climate of Tasmania is remarkable for its more slender spines, the much greater abundance of the long bristle-like hairs, and the thickness of the seal-brown under-fur, as compared with the typical Australian form. In North-west New Guinea the largest and most aberrant form is met with. Normally it has only three toes in place of five to each foot, the spines are very long and thick, the body is deeper and more compressed, and the animal stands comparatively high upon its feet.

The writer, during his residence in Tasmania, had several examples of the local species as domestic pets. For the first few days they were very shy and untractable, burrowing into the earth and seeking to escape, or presenting an impenetrable *cheval de frise* of sharp-pointed spines to the hands that sought to caress them. After a short interval, however, the creatures became entirely reconciled to human society and the small amount of restraint to which they were subjected. They would follow their owner about the garden, or, flattening their bodies and spreading out their limbs to the greatest extent, lie basking in the sun close to where he might be seated. They also apparently appreciated being carried, slung across their owner's arm after the manner of a lap dog. Living in the near vicinity of unreclaimed bush-land, it was found possible to keep these echidnas well supplied with their customary food; they were, in fact, permitted to forage on their own account. Liberated amidst their normal surroundings, they would walk leisurely from one ant-hill to another, tearing down the side of it with their powerful front claws, and appropriating its living contents with the greatest relish. It was observed, however, in this connection that the echidna paid attention entirely to the succulent white larvæ and pupal phases of the insects with which the inner chambers of the ant-hills are customarily crowded, and that adult ants, as they abounded in the tracts near at hand or elsewhere, were altogether neglected. In addition to this natural food these animals were supplied daily with a saucer of either well-softened bread or porridge and milk, for which they evinced a decided appreciation, assimilating this food dexterously, though somewhat slowly, with the aid of their long protrusile tongues. Allowed to wander about the house, they displayed a most inquisitive turn of mind, peering into every crevice, and climbing upon every accessible article of furniture.

The echidna usually produces only one egg at a time; it is relatively small, not larger than a sparrow's egg, but equally and obtusely rounded at both extremities, and with a white leathery shell like that of a reptile. For some time previous to hatching, this egg is carried in a skin-fold or rudimentary pouch in the parent's abdomen, much similar to that possessed by many of the marsupials. The young one is also retained in this pouch for some weeks after escaping from the egg. When finally leaving the pouch, it is between three and four inches in length, and the spines are in an altogether rudimentary condition.

Examples of the Australian echidna have on several occasions been "in residence" at the Zoo; while the Hon. Walter Rothschild has been fortunate in keeping living specimens of both this and the very rare three-toed New Guinea variety in his admirably appointed menagerie at Tring.

THE PLATYPUS

The egg-laying mammal known as the DUCK-BILLED PLATYPUS differs very essentially from the echidna both in aspect and habits. It is adapted especially for an amphibious life, and for feeding on molluscs, worms, and insects, which it abstracts from the muddy bed or banks of the rivers that it frequents. The somewhat depressed ovate body is covered with short dense fur much resembling in colour and texture that of an otter. The tail is short and flattened like that of a beaver, but in place of being naked and scaly, as in that animal, is covered, on the upper surface more

Photo by W. Saville-Kent, F.Z.S.

COMMON OR VIRGINIAN OPOSSUM

The only marsupial animal found north of Mexico particularly, with long, coarse, bristle-like hairs that intercross one another in all directions. Neither is this tail used, as with the beaver, as a mason's trowel, it being simply subservient as a steer-oar. The feet are all four distinctly webbed, the membranes of the front feet in particular projecting to some distance beyond the extremities of the claws, and so communicating to these members a singular resemblance to the feet of a duck. The head of the platypus tapers off from the body without any conspicuous neck, and terminates in a most remarkable duck-like beak, having at its base a supplementary membranous ferrule-like structure which would seem to serve the purpose of limiting the distance into which the beak of the animal is thrust into the mud during the quest for its accustomed food, and at the same time protecting the creature's eyes. The mouth of the adult platypus contains no teeth, simply a few horny plates; but, singularly to relate, rudimentary teeth exist temporarily in the young animals. These provisional teeth, moreover, correspond in a marked manner with those of some ancient types of mammals which occur as fossils in the tertiary deposits of North America. The platypus, with relation to the obliteration of its teeth in the adult state, is regarded as a very exceptionally modified form and not as the immediate prototype of the ordinary mammals.

The platypus is found in Tasmania and in the south and eastern districts of Australia only, being altogether unknown in the west and north. Being especially shy and retiring, and to a large extent nocturnal in its habits, it is not frequently seen even in districts where it may be rather abundant. The animal excavates burrows of so great a length as from thirty to fifty feet in the river-banks that it frequents, and at the extreme end of these burrows it constructs a loose nest of weeds and root-fibres, which it uses as its retreat, and also for the production of its eggs and young. There are invariably two entrances to these burrows, the one being under water, and the other usually opening into a tangle of brushwood at some little distance from the water's edge. As many as from one to four eggs and young may be produced at a time, but two is the more general number. From the first it would appear that the eggs and young are deposited and nursed in the nest, not being retained or carried about in a pouch, as observed of the echidna.

The late Dr. George Bennett, of Sydney, New South Wales, has probably placed on record the most detailed account of the ways and life-habits of these remarkable animals, though it did not fall to him to solve the much-vexed question as to whether or not they were oviparous. This discovery, as applied also to the like phenomenon in the case of the echidna, was the outcome within quite recent years of the researches of Mr. Caldwell. After much indefatigable exploration, in which he was ably assisted by the natives, Dr. Bennett obtained from the extremity of an exceptionally long burrow a mother and pair of half-grown young. The young ones survived several weeks, and proved most droll and interesting pets. In playful habits they much resembled puppies, chasing and rolling one another over, and pretending to bite with their toothless bills. They were also much addicted to climbing every scalable article of furniture, including even a tall book-case, which they would negotiate by "swarming" up behind it as a sweep climbs a chimney, with their backs to the wall and their feet against the back of the book-case. The sleeping and waking hours

Photo by D. Le Souef] [*Melbourne*

ECHIDNA, OR ANT-EATING PORCUPINE

The female echidna can carry two eggs in her pouch, which in due course are hatched by the heat of her body

Photo by W. Saville-Kent, F.Z.S.

TASMANIAN ECHIDNA, OR PORCUPINE ANT-EATER

This is the largest variety of the five-toed species; it grows to a length of 20 inches, and has the fur so long as almost to conceal the spines

that both these and other examples kept were observed to be very irregular; for while usually most lively and disposed to ramble after it grew dusk, they would at other times come out of their own accord in the daytime, or perhaps one would ramble about while the other slept. When going to sleep, they would roll themselves up in a perfect ball, the head, tail, and limbs being closely folded over the abdomen.

The food question appears to have presented almost insurmountable difficulties so far against the permanent acclimatisation of these interesting animals in any of our European zoological gardens. At the Melbourne Zoo some considerable success was obtained by fencing off a small pond abounding with insects and well-established water-plants for their reception, and in this instance they had also the advantage of being brought speedily and within a few hours of their capture to their new home. For their long voyage to Europe the provision of an adequate quantity of living insects or other aquatic organisms is a by no means easy task. They have, however, been known to thrive on broken-up river-mussels for the space of two or three weeks, and would probably have done so for a longer period. This material might easily be stored for their use on board ship.

An incident concerning the natural predilections of the platypus that fell within the writer's observation in Tasmania might also be utilised in their experimental transportation. At the trout- and salmon-rearing establishment on the river Plenty—of which the writer was at the time superintendent—the platypuses proved to be most destructive to the spawn both deposited in the hatching-boxes and upon the natural spawning-beds, or "redds," and they had in consequence to be systematically destroyed. This being the case, it is probable that they would be found to thrive well on a diet consisting to a large extent of the preserved roes or spawn of any easily procurable fish—such as the Murray perch and cod—and of which adequate supplies might with facility be stored aboard ship. The admixture in all cases of a certain amount of sand or mud with their provided pabulum would appear to be essential for digestive purposes, such material being always found in considerable quantities in their stomachs when dissected.

A distinguishing feature which the male platypus shares in common with the echidna is the peculiar spur developed on its hind foot. It is in this case, however, much larger and sharper, and has been accredited with aggressive functions and poisonous properties. There can be little doubt, however, that they are normally used by the animal only as clasping or retaining instruments during intercourse with the female at the breeding-season. At the same time, undoubted cases of persons receiving severe wounds from these animals' spurs have been placed on record. One such that fell within the writer's cognisance happened on the Murray River, on the Victorian and New South Wales boundary. A young fisher-lad, on taking up his nets, found a half-drowned platypus entangled in them, and, whilst disengaging it, it convulsively gripped his hand between the two spurs, the points penetrating deeply into the flesh on either side. The result was a festering wound that refused to heal for many months, and for such time entirely deprived the lad of his use of that hand.

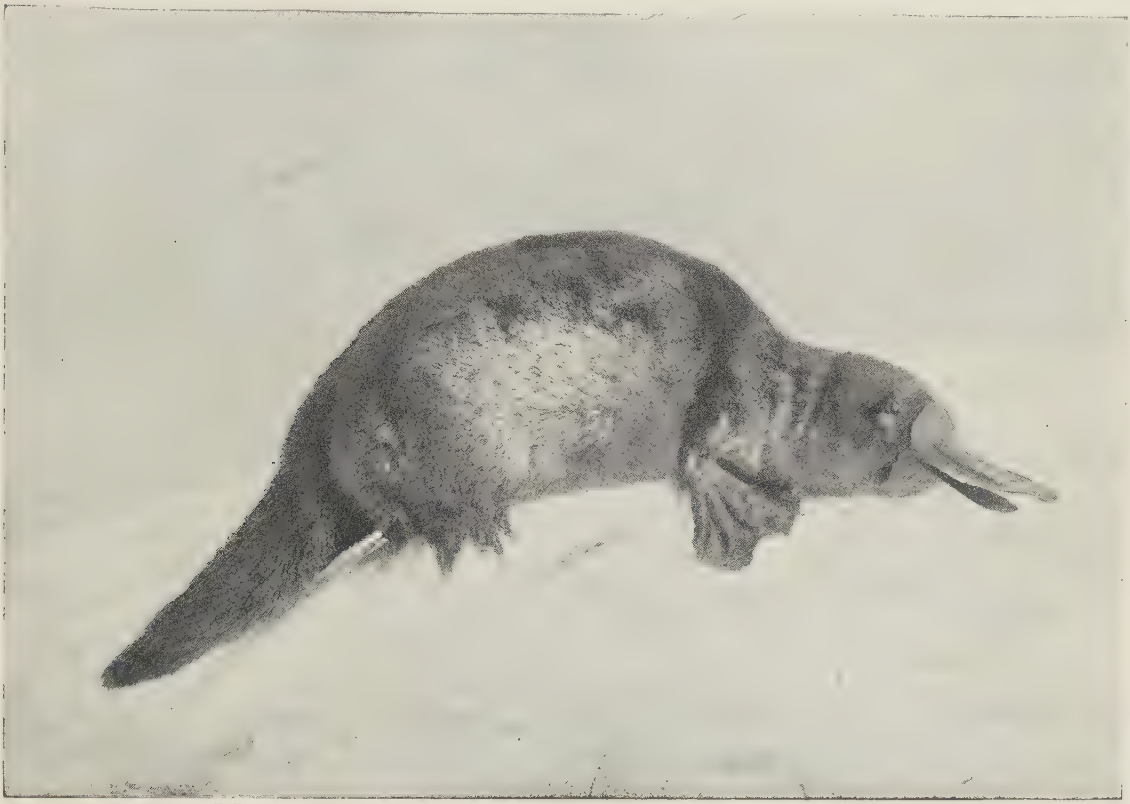


Photo by W. Saville-Kent, F.Z.S.

DUCK-BILLED PLATYPUS

This curious egg-laying mammal, the only representative of its family, is mainly nocturnal in habits

The fur of the platypus, dressed so as to remove the outer and longer series of hairs, nearly resembles that of the fur-seal in both colour and texture, and as a rare local product is highly prized for the manufacture of carriage-rugs and other articles.

WITH the egg-laying Echidna and Platypus we terminate the Mammalian Series, and they pave the way to the typical egg-laying animals which follow.

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